POTRERO YARD MODERNIZATION PROJECT

Exhibit 18:

Technical Requirements

November 15, 2024

FINAL

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Division 1: General Provisions

POTRERO YARD MODERNIZATION PROJECT

Exhibit 18:
Technical Requirements

Division 01:
General Provisions

November 15, 2024

FINAL DRAFT

TABLE OF CONTENTS

PROJECT DESCRIPTION

The Project will demolish the SFMTA's existing, outdated 100+ year old transit facility located on 4.4 acres at 2500 Mariposa Street, between 17th, Bryant, and Hampshire Streets and replace it with a modern, three-story bus maintenance, storage, and training facility to service the SFMTA's all electric trolley bus transit fleet, which may transition in the future to battery-electric buses. The IFM Facility will provide efficient transit-related services to San Francisco, aligning with SFMTA's commitment to safe, equitable, and sustainable transportation. The Project also demonstrates the City's commitment to zero-emission public transit, to delivering modern amenities for SFMTA employees, and to contributing a new building with improved site connectivity and urban design to the Mission and Potrero neighborhoods. As a core facility for the SFMTA's citywide transit operations, the Project represents an operationally critical public infrastructure project for the City.

Additionally, development plans are proposed to build mixed use commercial and residential uses adjacent to and above the Bus Yard Component to help the City towards fulfilling its 2022 Housing Plan. As an alternative, if housing above the Bus Yard Component is not feasible, City may choose to build a Paratransit Facility above the Bus Yard Component as a permanent site for paratransit operations, which are currently located on leased land elsewhere.

The Project consists of a single, integrated facility with a Bus Yard Component and Common Infrastructure, which are generally described as follows. Joint Development Alternative 1 or 2 would be subject to a separate HCC Agreement:

Bus Yard Component (or BYC). The BYC shall be a podium structure with four levels for bus storage and maintenance. The BYC includes bus and non-revenue vehicle parking and circulation; bus maintenance service and storage facilities; and administration offices, a bus operator training facility, and other support spaces. The BYC must have the minimum capacity to store at least 213 buses, which is a nearly 50% increase in capacity from the current operation. In addition, for resiliency purposes, the BYC must be built to structural and seismic standards that exceed the minimum code requirements. The BYC will have the required infrastructure to support the SFMTA's future transition to a fully battery electric bus fleet, and shall achieve LEED Gold rating and meet other City sustainability policies. The BYC shall also include a retail space at the corner of 17th and Hampshire, provided as a 'warm shell' that is operationally ready for permitted occupancy with electrical and water service metered separately from the Infrastructure Facility, security card access, and a surveillance system.

Joint Development Alternative 1 Housing and Commercial Component (or HCC): The potential HCC is the preferred alternative, which is envisioned to be a multi-floor housing project immediately adjacent to and on the perimeter of the Bus Yard Component podium along Bryant Street and one or more multi-floor housing projects on top of the Bus Yard Component podium. This option would also include ground floor uses, appropriate for a diverse neighborhood, to activate street frontages at the perimeter of the podium such as commercial or other uses. HCC development is not part of the Project and is subject to a separate HCC Agreement.

Joint Development Alternative 2 Paratransit Component (or Paratransit): Should housing development on top of the Bus Yard Component podium be deemed infeasible, per the terms of the HCC Agreement, then the City may direct the Principal Project Company to develop Paratransit Facility on top of the BYC podium. Paratransit would provide facilities and provisions to enable the SFMTA to service, maintain, and store a fleet of buses and vans. Paratransit will consist of bays and shops, operations areas, maintenance areas, and vehicular ramps extending onto the roof of the BYC providing access to and from the BYC podium roof. Please refer to *Division 3* of the Technical Requirements for a complete definition of and requirements for the

Paratransit Facility. Also, subject to the HCC Agreement, a multi-floor housing project immediately adjacent to and on the perimeter of the Bus Yard Component podium along Bryant Street will be developed as part of this Alternative.

Common Infrastructure (CI). The Common Infrastructure is the physical infrastructure shared by the BYC and the Joint Development Alternatives. The scope of the Common Infrastructure generally includes: (a) the BYC's structural system necessary to support either Joint Development Alternative; (b) the complete building envelope of the Facility, including cladding, waterproofing, and insulation; (c) shared vertical circulation elements, such as stairs, emergency egress, and elevators; (d) shared or common areas such as open space (e.g., public or private), shared lobbies, and shared service areas (e.g., loading docks, storage spaces, waste handling facilities, etc.) excluding residential use lobbies and elevators; (e) shared or common utility and building systems (e.g., systems such as mechanical, electrical, plumbing, fire and life safety, communications, etc.) and their corresponding spaces and vertical/horizontal distribution chases; and (f) drainage and stormwater management systems. The scope for the Common Infrastructure is defined below.

Together, the Bus Yard Component and the Common Infrastructure make up the Infrastructure Facility. For an avoidance of doubt, the Infrastructure Facility must fully enable the design, construction, operations and maintenance of either Joint Development Alternative. The entirety of the Infrastructure Facility requirements are provided throughout this Exhibit 18 (Technical Requirements).

Scope of Common Infrastructure

Table 1 below defines the systems, spaces, and elements considered Common Infrastructure to be delivered by Principal Project Company as part of the Project. Each item is further defined in the Technical Requirements or will be required through the Regulatory Approvals process.

Table 1: Facility's Systems, Spaces, and Elements included in the Common Infrastructure

Common Infrastructure Scope Item	Description
Building Systems	
Structural system	The portions of the vertical and lateral structural system of the BYC needed to support the HCC. This includes: (a) the BYC's roof structure supporting the HCC over it; (b) the vertical structure and complete foundations system; and (c) the BYC's complete lateral force resisting system including foundations, collectors, etc.
Building envelope	The complete exterior envelope of the entire Facility, including cladding, waterproofing, and insulation. The building envelope includes the waterproofing system of the roof structure supporting the HCC over the podium.
Demising walls separating the BYC from the HCC	If Principal Project Company's approach for the Project provides demising walls that are designed and constructed as a single wall assembly, then demising walls will be considered to be part of the Common Infrastructure. If Principal Project Company's approach for the Project provides demising walls that are designed and constructed as two separate and independent wall assemblies – one facing the BYC and the other facing the HCC –, then each will be considered to be part of the corresponding Project component.
Signage and wayfinding systems	All signage and wayfinding components for the building spaces allocated to the Common Infrastructure.
Building MEP systems and common utility systems	If Principal Project Company's approach for the Project includes common utility systems for the Facility as a whole, as described in Division 4 (*Supplementary Design Criteria*) of the Technical Requirements, then the common utility systems will be part of the Common Infrastructure. In this case, they will include the Facility-wide building management system. If Principal Project Company's approach for the Project provides for separate building mechanical, electrical, and plumbing systems for each Project component, then each such system will be part of the corresponding Project component. In this case, each component will have an independent building automation system (BAS). In all cases each Project component shall have separate metering.

Common Infrastructure Scope Item	Description
Fire and life-safety systems	If Principal Project Company's approach for the Project includes an integrated Facility-wide fire and life-safety system, then the fire and life-safety system will be considered to be part of the Common Infrastructure. In this case, it will include the Facility-wide fire and life-safety control systems. If Principal Project Company's approach for the Project provides for separate fire and life-safety systems for each Project component, then each such system will be considered to be part of the corresponding Project component. In this case, each component will have an independent fire and life-safety control systems
Civil and Site utility systems	The Facility's stormwater drainage systems (including risers, inlets, catch basins, sump pumps, sewer ejector pumps, surge tanks, sub-drains, separators, and piping), water distribution systems (including mains, water treatment equipment, storage, controls, valves, irrigation for common use areas, non-potable/reuse systems, fire suppression systems, and meters), sanitary sewer systems (including sewer lines, lift stations, main connections, underground delivery systems, separators, backflows, and traps), utility connections, and related systems. Each Project component shall have separate metering.
Building Spaces	
Building system spaces	All rooms containing a supportive function for any civil and site utility systems, MEP systems, and/or common utility systems that are allocated to the Common Infrastructure as described above. Includes their associated distribution chases, shafts, or raceways, whether vertical or horizontal.
Vertical circulation	All stairs, emergency egress, escalators, and elevators in the Facility, that have shared uses by the BYC and HCC. This includes all the mechanical and electrical systems for vertical conveyance systems that have shared used by the BYC and the HCC. For avoidance of doubt, vertical circulation elements that are for the exclusive use of either the BYC or the HCC are not included in the scope of the Common Infrastructure.
Common-use spaces	All common use enclosed or open spaces (whether public or private, including the podium roof open space), any shared entrance lobbies, shared restrooms (whether public or private), and shared service areas (e.g., loading docks, storage spaces, waste handling facilities). For avoidance of doubt, entrance lobbies or other spaces that are for the exclusive use of either the BYC or the HCC are not included in the scope of the Common Infrastructure.

BYC = Bus Yard Component

HCC = Housing and Commercial Component

MEP = mechanical, electrical, and plumbing

1. GENERAL PROVISIONS

1.1. PROJECT MANAGEMENT

A. Principal Project Company is responsible for all elements of the management of the Project. Principal Project Company shall manage the Project through the application of a defined management approach, procedures, systems and reporting mechanisms, designed to maintain control of scope, schedule, quality, and budget, as further defined herein.

B. Where submittals to the City are required in this Division 1 and other sections of this Exhibit 18, they shall be made in accordance with the submission dates and for the City action defined in Exhibit 18, Division 1 Appendix B (Initial List of Submittals).

C. When planning or executing Project management, Principal Project Company shall consider and address all applicable Law, including those in Exhibit 16 (Federal, State, and Local Requirements) and other requirements that may result from the Project receiving Federal funding.

1.1.1. Project Management Plan

A. Principal Project Company shall submit to the City a D&C Project Management Plan (PMP)and incorporating the essential elements of a successor plan for IFM Services (the "IFM Management Plan") that describes the management approach, procedures, systems and reporting mechanisms, and provides scope, schedule, quality, and cost management for the D&C Period. Principal Project Company shall manage the Project in accordance with the City-approved PMP.

B. Principal Project Company's PMP shall, at a minimum:

1. Provide a detailed Project description and summary scope of work.
2. Provide clear, actionable and measurable objectives of the Project.
3. State the purpose of the PMP, which description shall delineate how the Project is going to be managed by Principal Project Company, with support from and through the performance of Principal Project Company-Related Entities, including separate D&C Contractor and IFM Provider.
4. Describe and distinguish between the roles and responsibilities, including the organizational structure, of the Principal Project Company and Principal Project Company-Related Entities to perform their corresponding scope of the Work as well as how the Principal Project Company will manage the interfaces where one entity's corresponding scope of the Work interfaces with another.
5. An organizational chart that clearly illustrates these roles and responsibilities among Principal Project Company and Principal Project Company-Related Entities.
6. Identify the products and services that the Project will deliver to the City and others.
7. Incorporate the Project Schedule.
8. Identify the key Stakeholders (and their personnel), defining their roles and responsibilities on the Project.
9. Describe the process for managing and reporting on progress status against the baseline requirements in the various plans required by the Technical Requirements.

10. Describe the process for information management, how Principal Project Company will exchange information with the City.
11. Describe change management procedures and protocols to incorporate and accept modifications to the Agreement scope.
12. Explain the development, establishment, and management approach for the Project Schedule, and how progress measured against the planned schedule will be evaluated and reported.
13. Describe (i) the process for developing, implementing, and managing a D&C Quality Management Plan, and (ii) how quality results will be independently observed, measured, reported, and documented for the Project to ensure that the Project deliverables and completed Work meet the minimum required standards of quality.
14. Explain how human and material resources will be applied to the Project.
15. Define the lines of communication and the methods of communication to be used, identifying roles and responsibilities with respect to communications, and defining what each individual role is responsible for communicating and to whom, how frequently they need to communicate, which communications tools and media will be used, and any specific triggers for initiating communication.
16. Coordinate and incorporate all other Project-specific plans, including those supplemental plans defined in Section 1.1.7 (Design and Construction Management Plans), identifying through cross-referencing such plans.
17. Be sufficiently developed and readily updatable to facilitate external audits, including audits performed by the City.
18. Describe how the Principal Project Company plans to utilize Disadvantaged Business Enterprises .

1.1.2. General Coordination with the City

A. Principal Project Company shall establish a comprehensive coordination process with the City to minimize risk impacts to scope and schedule performance associated with contracts for design, construction, and systems integration activities. Refer to separate provisions in Section 1.12 (Coordination with Third Parties) and Section 1.13 (Coordination with Utility Owners).

1.1.3. Project Meetings

A. Principal Project Company shall conduct Project meetings to enable orderly review of the progress of the Work with the City, and to provide for systematic discussion of items and issues affecting the progress and outcome of the Work. The following are initial and ongoing meeting minimum requirements, Principal Project Company shall propose additional meetings as needed to fulfil the Agreement requirements.

B. Principal Project Company personnel attending and participating in Project meetings as Principal Project Company representatives shall have the required levels of authority to commit Principal Project Company to actions and resolutions agreed upon during such meetings.

C. Principal Project Company shall electronically manage meeting calendars, notifications and invitations on a real-time basis.

D. Principal Project Company shall, to the greatest extent possible, provide to the City agendas and meeting materials at least three Business Days in advance of meetings. Principal Project Company shall lead and facilitate meetings and shall prepare and distribute meeting minutes to the City and all attendees for their review and comment within three Business Days after concluding the meeting.

E. The City may require, with reasonable notice to Principal Project Company, additional meetings at any time, at no additional cost to the City.

1.1.3.1. Project Work Initiation Meeting

A. Principal Project Company shall conduct a Project Work initiation meeting upon receiving the City's notification of Contract award and shall submit to the City the agenda and meeting minutes. Key Personnel shall attend the Project Work initiation meeting and those in attendance shall address:

1. Project Management Plan, including Key Personnel resumes and team organization chart.
2. Initial Schedule.
3. Approach to D&C Work and IFM Services.
4. Information Management Plan.
5. Third Party and Utility Owner Coordination Work and Project Execution Plans, including integration and permits.
6. Quality Program Plan.
7. Plan and status for development of various other required Project Plans.
8. Submittal procedures and document control/records management.
9. Inclusivity, including Small Business Enterprise, Local Business Enterprise, Local Small Business Enterprise and Disabled Veteran Business Enterprise participation.
10. Approach to sustainability.
11. Public Outreach Plan.
12. Insurance certificates and other commercial/financial instruments needed before commencing with the Work.
13. Early Works and other topics deemed necessary by the City or Principal Project Company.

1.1.3.2. Design Initiation Meeting

A. Principal Project Company shall conduct a Design Initiation Meeting upon receiving the City's NTP 1 and shall submit to the City the agenda and meeting minutes. Key Personnel shall attend the Design Initiation Meeting and those in attendance shall address:

1. Design Management Plan, including lead personnel and design team organization chart.
2. Explanation of Design Work locations and logistics.
3. Submittals list and design review procedures.

4. Principal Project Company Design Quality Plan.
5. Design of safety considerations.
6. Design of security considerations.
7. Information Management Plan.
8. Third Party and Utility Owner Coordination Work Plans, including integration and permits.
9. BIM Project Execution Plan.
10. Other topics deemed necessary by the City or Principal Project Company.

1.1.3.3. Construction Initiation Meeting

A. Principal Project Company shall conduct the Construction Initiation Meeting prior to NTP2 and shall submit to the City the agenda and meeting minutes. Key Personnel shall attend the Construction initiation meeting and those in attendance shall address:

1. Major construction and field activities.
2. Construction Management Plan, including lead personnel and construction team organization chart.
3. Explanation of construction field offices, storage yards, materials laydown and staging areas, crane locations, etc..
4. Most current Project Schedule incorporating timing of deliveries, construction phasing plans, and other worksite logistics.
5. Principal Project Company Construction Quality Plan.
6. Construction Quality Work Plans.
7. Information Management Plan.
8. Third Party and Utility Owner Project Execution Plans, including integration and permits.
9. Plan to demarcate any restricted zones and within the Project Site.
10. Construction safety plans in compliance with Division 10 of the Technical Requirements (Exhibit 18)
11. Site Security Plan.
12. Health and illness prevention plans.
13. Transportation Management Plan and Traffic Control Plan.
14. Environmental permitting, monitoring and mitigation measures compliance plans and reporting.
15. Project controls processes and procedures for maintaining and retrieving current status documents, and including protocols for archiving and safekeeping Record Documents.
16. BIM Project Execution Plan.
17. Other topics deemed necessary by the City or Principal Project Company.

1.1.3.4. Quality Initiation Meeting

A. Principal Project Company shall conduct a Quality initiation meeting within 15 Days after concluding the Project Work initiation meeting and shall submit to the City the agenda and meeting minutes. This meeting shall include discussion of all aspects of the Principal Project Company Quality Program (see Section 1.4.1) with a focus on implementing required processes and procedures.

B. The meeting shall introduce individuals comprising Principal Project Company's quality management staff during the D&C Period, and shall include discussion on testing and inspections, quality program surveillance and audits, and identifying and resolving nonconforming Work and deficiencies in both Design Work and Construction Work.

1.1.3.5. Environmental Compliance Initiation Meeting

A. Principal Project Company shall conduct an Environmental Compliance initiation meeting within 60 Days after NTP1 and prior to commencing any D&C Work, and shall submit to the City the agenda and meeting minutes. The meeting shall include discussion of the Sustainability Management Plan, all aspects of the environmental mitigation, protection, and permitting requirements applicable to the D&C Period, and shall address green initiatives associated with sustainable design and construction, including the environmental procedure requirements in Division 10 of the Technical Requirements. Principal Project Company shall show these permitting targets (or milestones) on the Project Schedule and shall explain the work plans and processes to be followed to achieve each requirement.

1.1.3.6. Weekly Project Coordination Meetings

A. Weekly Project coordination meetings shall be conducted by Principal Project Company throughout the D&C Period covering a three-week Project Schedule review period (one week back and two weeks forward) of daily activity including schedule activities and sub-activities, interfaces, milestones, deliveries, and other events significant to Project Schedule performance.

B. Principal Project Company shall prepare and submit to the City the agenda for each Weekly Project coordination meeting and include meeting minutes from the previous week's meeting.

C. Representatives of Principal Project Company's team responsible for the activities presented in the Three-week Look-ahead Activity Reports, as defined in Section 1.2.1.7 (Look-Ahead Activity Reports), shall be present to discuss activities and coordination with others.

D. Weekly Project coordination meetings shall include invited representatives of Third Parties, Utility Owners, and specialty engineers and subcontractors as necessary. Principal Project Company shall invite the City to these meetings, who may have representatives attend representing subject matters related to the schedule activities.

E. Weekly Project coordination meetings shall address, but not be limited to, the following:

1. Precedence and other constraints caused by outside parties that occur during the forthcoming two weeks that may potentially delay the Project Schedule activity or sub-activity.

2. Issues and actions that are needed to maintain these scheduled activities and sub-activities, such as Regulatory Approvals, material deliveries, equipment mobilization and setup. and
3. Actual schedule accomplishment defined in the previous week reflected in the Project Schedule.
4. Progress on Regulatory Approvals and Regulatory Approvals Plan
5. Status and track of Delay Events and Relief Events and
6. Status and tracking of City Changes.

1.1.3.7. Monthly Progress Meetings

A. Principal Project Company shall conduct Monthly Progress Meetings and shall submit to the City meeting minutes. Attendees shall include, at a minimum, Key Personnel and the City representatives. Principal Project Company shall commence the first of Monthly Progress Meetings one week after submission of the first Monthly Progress Status Report, and continue these progress meetings throughout the D&C Period. Such meetings shall include, at a minimum, discussion of progress updates and issues for the following topics, as appropriate:

1. Project Schedule, including actual progress during prior 30-day reporting cycle and progress forecasted for next 90 Days.
2. Design Management Plan and Construction Management Plan updates.
3. Quality. Quality Program Plan and various quality plan updates.
4. Safety. Health and Safety Plan update, see Section 01 35 45 of Division 10 of the Technical Requirements.
5. Security. Site Security Plan update.
6. Environmental compliance and permitting. Sustainable Management Plan update.
7. Third Party and Utility coordination. Third Party and Utility Project Execution Plan updates.
8. Traffic detours and maintenance of traffic. Transportation Management Plan and Traffic Control Plan updates.
9. Inclusivity.
10. Public outreach. Public Outreach Plan update.
11. Submittals and review process.
12. Design modifications and other changes in scope, coordination on Allowance-related scope, schedule and costs impacting budget and schedule forecasts, along with proposed mitigations and/or corrections. Regulatory Approvals Plan, Design Management Plan and Design Progress Tracking Reports. Substantial Completion planning and coordination.
13. Other pertinent and timely discussion topics.

1.1.3.8. Ongoing Coordination Meetings

A. Principal Project Company shall arrange and minute additional meetings as described herein Division 1, and as needed to fulfil the Agreement, such as:

1. Third Party coordination meetings
2. Utility coordination meetings
3. City outreach meetings
4. Community Stakeholder meetings
5. Potrero Yard Neighborhood Working Group meetings

1.1.3.9. Special Meetings

A. Principal Project Company shall conduct special meetings as necessary throughout the D&C Period, including meetings at the City's request. Special meetings may include timely discussions of any issues relevant to the Project.

B. Principal Project Company shall provide, within the meeting invitation, a brief narrative about the issue or concern and a brief narrative of any suggested solutions to mitigate adverse schedule and cost impacts.

C. Principal Project Company shall schedule meetings to discuss testing, performance demonstration, and operational readiness with no less than five Business Days' advance notice to invitees, and shall endeavor to enclose briefing materials within the body of the meeting invitation.

D. Principal Project Company shall schedule other special meetings with not less than five Business Days' notice otherwise it is in the City's sole discretion for participation in the meeting.

1.1.4. Key Personnel

A. Principal Project Company shall provide individuals meeting the requirements of each Key Personnel position defined in this Section 1.1.4.

B. Principal Project Company shall prepare, submit to the City, and maintain a Key Personnel register with name, firm, title, project role, address, email, and phone number for each Key Personnel as well as resumes. Key Personnel shall meet the requirements of Section 9.5 of the Agreement. Key Personnel shall not be changed or replaced without the City's concurrence as evidenced by documented review and acceptance of a replacement in advance.

C. Principal Project Company shall submit to the City resumes for any proposed replacement of Key Personnel, each a Candidate Key Person Replacement resume with three references, aligned with the requirements of the Agreement. References shall be from previous owners, clients, or employers and include the name, position, company, or agency and current postal and email addresses and phone numbers for each reference. Accordingly, the City will formally respond and reserves the right to interview replacement Key Personnel candidates prior to their acceptance.

D. Where Key Personnel are required to be located at the Project Site, such requirement is deemed inclusive of location at the offices defined in Section 1.11.4.2 (Project Management Office Requirements) and Section 1.11.4.3 (Construction Management Office Requirements).

1.1.4.1. Project Director

A. The Project Director shall be responsible for managing PPC's day-to-day activities on a full-time basis for the Project, including ongoing communications and coordination with City and acting as the main point of contact between City and PPC.

B. The Project Director shall have, at a minimum, 20 years of competent experience in a senior position within an organization where his/her principal professional experience has been as an infrastructure developer.

1.1.4.2. Project Manager

A. The Project Manager shall have full responsibility for the execution of the Work on behalf of Principal Project Company.

B. The Project Manager for the D&C Period shall have, at a minimum, 15 years of competent experience in a senior position within an organization where he/she had responsibility for:

1. At least one P3 project with a capital construction cost of more than $150 million and a contract duration greater than 15 years; and
2. Integrating design, construction, operations and maintenance on at least one project of similar complexity.

C. The Project Manager for the IFM Period shall have, at a minimum, 10 years of relevant experience in a senior position within an organization where he/she had responsibility for directing operations and maintenance related activities for projects of similar complexity.

1.1.4.3. Deputy Project Manager

A. The Deputy Project Manager shall provide support to the Project Manager in performing the daily management and coordination of the Work on behalf of PPC.

B. The Deputy Project Manager for the D&C Period shall have, at a minimum, 8 years of progressive relevant experience where he/she had provided support for:

C. At least one design-build or P3 project with a capital construction cost of more than $150 million of similar scale and complexity.

D. Integrating design, construction, operations and maintenance on at least one project of similar complexity

1.1.4.4. Equity Member's Project Principal

A. The Equity Member's Project Principal is the person each Equity Member proposes as their representative principally responsible for that Equity Member's role on the PPC.

B. The Equity Member's Project Principal shall have, at a minimum, 15 years of competent professional experience.

C. If the Equity Member's Project Principal will also serve as the PPC's Project Director, that Equity Member's Project Principal shall have a minimum of 20 years of competent experience in a senior position within an organization where his/her principal professional experience has been as an infrastructure developer.

1.1.4.5. Engineer(s) of Record

A. Each Engineer of Record (EOR) shall have a bachelor's degree or equivalent diploma from an accredited educational institution and shall be a currently licensed professional engineer registered under the laws of the State of California. Engineer(s) of Record shall have experience, in a lead design role, on at least two projects of similar scope and complexity. each with a capital construction cost of not less than $150 million, completed within the last 10 years.

B. An EOR may also serve in the role of the Design Manager subject to demonstration of his/her qualifying experience and competence to the City's satisfaction.

1.1.4.6. Architect(s) of Record

A. Every Architect of Record (AOR) shall have a bachelor's degree or equivalent diploma from an accredited education institution and each individual shall be a currently licensed architect registered under the laws of the State of California. AOR(s) shall have experience, in a lead design role, on at least two projects of similar scope and complexity. each with a capital construction cost of not less than $150 million, completed within the last 10 years.

B. An AOR may also serve in the role of the Design Manager subject to demonstration of his/her qualifying experience and competence to the City's satisfaction.

1.1.4.7. Design Manager

A. The Design Manager is responsible for managing and overseeing the Project's development and coordination of the integrated design on behalf of Principal Project Company.

B. The Design Manager shall have relevant experience on at least three design-build projects, each with a capital construction cost of not less than $100 million. The Design Manager shall have at least 10 years of relevant design, supervisory and management experience.

C. The Design Manager shall be located in San Francisco bay area, assigned full-time from Financial Close until all major design milestones are completed.

1.1.4.8. Construction Manager

A. The Construction Manager is responsible for managing and overseeing the activities of construction on behalf of Principal Project Company, from pre-construction to the end of construction and turnover of the facility to its end-users.

B. The Construction Manager shall have previous relevant experience as a project/construction manager on at least three design-build projects, each with a capital construction cost of not less than $150 million.

C. The Construction Manager shall be located at the Site, assigned full-time and exclusively for the Project throughout the D&C Period and until Substantial Completion.

1.1.4.9. Quality Program Manager

A. The Quality Program Manager shall have the authority and responsibility for managing and overseeing quality-related activities for all aspects of the Work, including the establishment and maintenance of, and compliance with, the Quality Program Plan (PQPP).

B. The Quality Program Manager's Project-specific responsibilities shall be limited to only quality assurance and quality improvement. The Quality Program Manager shall act independently from Principal Project Company's staff and the duties of such staff associated with the execution of the Work.

C. The Quality Program Manager's authority shall be independent of the Project Manager and shall be equivalent to the authority of the Project Manager with respect to assuring and controlling quality results. It shall be the duty of the Quality Program Manager to report to superiors above the level of the Project Manager, and to the City, on the performance of, and compliance with, all Project management and quality plans. The Quality Program Manager shall be assigned full-time and exclusively for the Project throughout the D&C Period.

D. The Quality Program Manager shall have a minimum of 10 years of relevant quality management and supervisory experience on projects of similar scope and complexity. The Quality Program Manager shall have undertaken training in the use and application of internationally recognized quality programs, including the application of ISO 9001.

1.1.4.10. Third Party and Utility Coordination Manager

A. The Third Party and Utility Coordination Manager shall serve as the main point of contact for utility owners and the City, overseeing all utility work performed for the mutual benefit of the PPC and the City.

B. The Third Party and Utility Coordination Manager shall have, at a minimum, 5 years of previous relevant experience in at least two design-build projects, with at least one in the San Francisco area within the last five years.

C. The Third Party and Utility Coordination Manager shall be located at the Project Site, assigned full-time from Commercial Close until the end of the D&C Period, and upon request by the City, shall remain available until Final Acceptance.

1.1.4.11. Project Safety Representative

A. The Project Safety Representative (PSR) shall manage and oversee safety issues related to the Project, working closely with the Design Manager and the Construction Manager during the D&C Period and as specified in Division 10, section 01 35 45 of the Technical Requirements. During the IFM Period, the PSR shall work closely with the IFM Manager to assure safe and secure operation of the IFM Facilities, with required protection for patrons, employees and the public.

1.1.4.12. Infrastructure Facility Maintenance (IFM) Manager

A. The IFM Manager shall be responsible and authorized to act on behalf of Principal Project Company in matters pertaining to operations and maintenance of the IFM Facilities. Principal Project Company shall keep the City informed, in writing, of the identity and activities of the IFM Manager.

B. The IFM Manager shall have overall responsibility for Principal Project Company's IFM Services performed throughout the IFM Period and IFM Manager shall devote their time exclusively to their responsibilities in connection with this duty. City will have the right, using reasonable discretion, to approve or reject any IFM Manager selected by Principal Project Company if the qualifications under 1.1.4.8 are not met.

C. The IFM Manager shall have at least 10 years of progressive experience in daily maintenance and capital replacement activities for operating facilities of similar scope and complexity. Experience shall include seven or more years in a qualifying management position.

D. The IFM Manager shall be located in San Francisco assigned to the Project from no later than one year prior to the planned Substantial Completion and for duration of the IFM Period.

1.1.4.13. Infrastructure Facility Maintenance Quality Manager

A. The IFM Quality Manager is responsible for effectiveness of Principal Project Company's quality personnel throughout the IFM Period, qualifying and supervising experienced personnel in sufficient numbers to adequately perform the duties and fulfill obligations addressed in the Quality Management Plan or equivalent controlling documents. Such quality personnel shall report directly to the IFM Quality Manager.

B. The IFM Quality Manager shall hold a bachelor's degree or equivalent. The IFM Quality Manager shall have a minimum of five years of quality management experience on projects of similar scope and complexity and shall have undertaken training in the use and application of nationally recognized quality programs.

1.1.5. Principal Project Company Services

A. Principal Project Company shall be responsible for providing the following services during the Term:

1. Project management including cost control and management, schedule control and management, and risk management.
2. Information management.
3. Public information and communications.
4. Utility coordination.
5. Third Party coordination.
6. Interface management.
7. Environmental compliance and mitigation monitoring.
8. Safety and Security.

9. Quality assurance and quality control.
10. Design, design management and design assurance.
11. Develop and manage Allowances for Infrastructure Facility.
12. Develop and manage Provisions required to support the Joint Development Alternatives.
13. Subsurface and Site investigations
14. Surveys and land surveying.
15. Pre-construction.
16. Procurement.
17. Administration of Contractors, Suppliers and Vendors.
18. Construction and construction management.
19. Commissioning, Verification and achieving operational readiness.
20. Infrastructure Facility maintenance services.
21. Asset management and inventory control.
22. Capital asset replacement.
23. Handback.

1.1.6. Regulatory Approvals Plan

Principal Project Company shall prepare and submit to the City a Regulatory Approvals Plan defining its approach to obtain all Regulatory Approvals including approvals from City departments in their regulatory capacity, and all Authorities Having Jurisdiction. This plan shall specifically address the Principal Project Company's construction permitting plan that is coordinated with the Project Schedule.

1.1.7. Design and Construction Management Plans

Principal Project Company shall prepare a Design Management Plan and a Construction Management Plans as supplements to the PMP.

1.1.7.1. Design Management Plan

A. Principal Project Company shall prepare and submit to the City a Design Management Plan (DMP) describing its approach to undertake and achieve the requirements in Section 1.8 (Design Management).

B. The DMP shall:

1. Describe the design organizational structure, design phase management philosophy and staff positions, and descriptions of the organizational relationships within Principal Project Company's design, construction, IFM and quality management organizations;
2. Describe the planned design packaging scheme and reviews process, including internal, City's proprietary review packages, and permit reviews by all AHJs;
3. Describe the content and format of each design stage package submission;
4. Describe process and environment prescriptions to ensure development and coordination of the integrated design progresses reasonably;

5. Address when and how coordination will occur with the City regarding Allowances and any other City-furnished and installed FF&E;
6. Address provisions for the Joint Development Alternatives required in these Technical Requirements;
7. Address how the design deliverables will be managed to fulfill their associated deadlines to submit them for reviews and/or approvals;
8. Address how design reviews by the City will be managed by the Principal Project Company, including resolution and record-keeping of City design review comments;
9. Address how changes to the Project will be recorded, tracked, and communicated; and
10. Incorporate the Owner's Information Requirements and the BIM-enabled processes and workflows described in the BIM Project Execution Plan (see Section 1.10)

C. The Design Management Plan shall include a section that describes the Principal Project Company's procedures to obtain proprietary and regulatory design reviews and, as applicable, approvals of Design Deliverables. All proprietary design reviews shall be consistent with Exhibit 11 (Submittal Review Process) and Section 1.8.5(Proprietary Design Reviews).

1.1.7.2. Construction Management Plan

A. Principal Project Company shall prepare and submit to the City a Construction Management Plan (CMP) describing its approach to undertake and achieve the requirements in Section 1.11 (Construction Management).

B. The CMP shall include:

1. The construction organizational structure, construction phase management and staff positions, and descriptions of the organizational relationships within Principal Project Company's design, construction, IFM, and quality management organizations;
2. Principal Project Company's construction packaging plan, and include initial construction phasing and sequencing approach to the Project;
3. Principal Project Company's process for conducting pre-construction surveys for existing structures, utilities, and other infrastructure, as appropriate for the Work;
4. Explanation of how Principal Project Company will perform construction planning and logistics, with specific mention of when and how construction coordination will occur with the City regarding any City Furnished Equipment and
5. Request for Information and Change processes
    a. Including but not limited to changes during construction that affect the Joint Development Alternatives
    b. Such changes are subject to the requirements of Exhibit 9 (Change Procedures).

1.1.8. IFM Management Plan

Principal Project Company shall prepare and submit to the City a revised IFM Management Plan that describes the management approach for delivering the IFM Services. Principal Project Company's preliminary IFM Management Plan shall, at a minimum, among other tasks:

A. Provide clear description and delineation of the IFM Services and SFMTA O&M Services.

B. Develop a detailed plan to address customer service and work management support, including the approach to customer interface procedures and protocols through the Help Desk. This will also include the approach to receive, schedule and dispatch work requests.

C. Prepare a Human Resource plan that outlines the resourcing structure including on-site and off-site qualified personnel to perform the IFM Services. This will include clear roles and responsibilities.

D. Outline Principal Project Company's approach to maintain, repair, and replace elements of the Infrastructure Facility including Renewal Work, Scheduled Maintenance and Demand Maintenance. This will include:

   1. Estimated design life and Useful Life of assets.
   2. Criteria for determining whether rehabilitation, refurbishment or replacement will be necessary to meet performance and Handback requirements of assets.
   3. Identification of assets that are critical to the successful delivery of the project and require specific Scheduled Maintenance or subcontracting expertise.
   4. Process for assessing and reporting on the risk associated with asset failure and supporting mitigation strategies.
   5. Processes for ensuring that preventive maintenance is in line with Scheduled Maintenance plans
   6. Integration of IFM Services and the CAFM System

E. Approach to the development of IFM Services procedures intended to guide the on-going service delivery by Principal Project Company across general management and project-specific service areas.

F. Describe the process for developing a Quality Management Plan to manage and measure the quality of IFM Services

G. Outline how the Building Information Model will be updated in line with Renewal Work and other IFM Services

H. Approach to developing and maintaining assets such that they comply with the Handback Requirements

The revised IFM Management Plan shall be developed and submitted per the requirements in Division 7 of the Technical Requirements to approved by the City. Once approved, the final IFM Management Plan will supersede the preliminary IFM Management Plan included in Exhibit 2 (Project Management Plan).

1.2. PROJECT CONTROLS AND PERFORMANCE MEASUREMENT

1.2.1. Project Schedule

A. It is expressly understood and agreed that the time of beginning, the rate of progress, and the time of completion of the work are of the essence of the Agreement. The Work shall be executed with such progress as required to prevent any delay to the Project, the Contract Deadlines, and the general completion of the Agreement.

B. Principal Project Company's Initial Schedule shall be a detailed critical path method schedule, and shall govern all Work from the Effective date until NTP2.

C. Principal Project Company's Project Schedule shall be a detailed critical path method schedule for the entire Project, applicable from NTP2 to Final Acceptance, and shall incorporate scheduling information details exhibited in the Initial Schedule and subsequently updated and refined through an interactive process defined in Section 1.2.1.1 (Project Schedules).

D. The Project Schedule shall demonstrate that adequate planning, scheduling, and resource allocations occur to provide a reasonable and executable baseline work plan.

E. Principal Project Company shall use the applicable Project Schedule for coordinating the various Work sequences, monitoring the progress of completed Work activities, identifying pending Work, and evaluating the effect of scope changes and re-sequencing of Work activities. The Project Schedule and subsequent revisions and updates shall comply with all requirements defined in Section 1.2.2 (Schedule Requirements) and shall be broken down into work packages and deliverables of reasonable duration for all activities, and not exceeding 10 working days for each construction activity for which progress can readily be reported and verified.

F. The Project Schedule shall include all required City and Third Party activities and/or milestones. At a minimum, these activities and milestones shall include:

   1. Availability of right-of-way, reviews of submittals, and special instructions as may be detailed in the Contract Documents; and

   2. Adequate time for City to install and test any City-furnished FF&E related to an Allowance or the preliminary equipment list.

G. The Project Schedule shall comply with all schedule requirements of the Contract Documents. The Project Schedule shall have activities depicting a logical sequence of coordinated work products and deliverables each of reasonable duration, generally of not more than 10 working days duration for construction activities, for which progress can be readily reported and verified.

H. Design Work, including time-critical preconstruction planning and coordination, may commence immediately after Principal Project Company's receipt of NTP 1, provided however, that such activities are addressed in the Design Management Plan and Principal Project Company's Design Quality Plan, for which submissions have previously been received by the City.

I. In the event the Contractor fails to define any element of work, activity or logic and the City review does not detect this omission or error, such omission or error, when discovered by the Contractor or City, shall be corrected by the Contractor at the next monthly Schedule Update and shall not affect any Contract Deadline.

J. Pursuant to float sharing requirements of this Section, use of any float-suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times or durations are prohibited.

K. The City-Furnished Equipment, if any, are the Principal Project Company's responsibility to identify as separate construction activities. Indicate delivery dates, logic ties to predecessor and successor activities or schedule windows of such items set forth in the Contract or furnished by the City.

L. The Principal Project Company is responsible to include Project start-up, testing and commissioning activities in the Project Schedule detailing all activities needed to provide a fully functional facility that meets all building management systems, fire-life-safety and City requirements in accordance with Division 6 of the Technical Requirements.

1.2.1.1. Project Schedules

A. Several forms of the Project Schedule shall be required, as further defined below:

1. Project Schedule
2. Revised Project Schedule
3. Recovery Schedule(s)

B. Principal Project Company shall archive each monthly progress report and schedule update, together with all the City-approved Project Schedules.

C. Principal Project Company shall maintain an up-to-date and validated As-Built Schedule throughout the course of construction.

1.2.1.2. Project Schedule

A. Principal Project Company shall submit to the City for review and approve an update to the Initial Schedule detailing all D&C Work activities between NTP2 and Final Acceptance to a Level 4 as defined in AACE 91R-16 "Schedule Development" and following all schedule requirements established in this section 1.2 of Division 1 in accordance with Exhibit 11 to the Agreement (Submittal Review Process). This update of the Initial Schedule shall be submitted no later than 90 Days prior to scheduled NTP2 and conform to all milestones in the Agreement and the Initial Schedule (as applicable). This Project Schedule, once accepted by the City, shall be saved by Principal Project Company as a unique schedule file that, along with its associated reports and back-up documentation, establishes the Project Schedule. A City-approved Project Schedule is a condition precedent to NTP2.

B. Principal Project Company shall use the Initial Schedule as the basis for the Project Schedule, closely matching key activity sequences and milestones included in the Initial Schedule and conforming with all project schedule milestone requirements set forth in the Agreement.

C. Prior to NTP 2, Principal Project Company shall provide progress reporting against the Initial Schedule.

1.2.1.3. Revised Project Schedule

A. Principal Project Company shall, throughout the D&C Period, update the Project Schedule to reflect actual progress and status of the Work. These updates shall not amend the contractual milestones in this Agreement.

B. If the Project Schedule needs to be amended as a result of a Change Order or Compensable Delay Event, the revised and City-approved schedule shall replace the previously established Project Schedule and, henceforth, shall be the Revised Project Schedule.

1.2.1.4. Recovery Schedule

A. Whenever the Project Schedule shows any schedule activities with a completion date having 15 Days or more negative float, Principal Project Company shall prepare and submit to the City a Proposed Recovery Schedule. Such submittals shall include a list of all activity and resource changes required to eliminate such negative float and an accompanying narrative explaining the nature of such changes. The recovery schedule shall be a separate submittal from the Project Schedule Monthly Update (see Section 1.2.1.5), unless the City elects to waive the separate submittal upon determining that current Project Schedule is acceptable with only minor changes.

B. If the proposed schedule revisions include sequence changes, Principal Project Company shall provide a fragmentary network (fragnet) schedule diagram that compares the original sequence to the revised sequence.

C. After obtaining formal acceptance by the City, the approved Recovery Schedule shall replace the previously established Project Schedule and shall be the Project Schedule.

D. If Principal Project Company's proposed schedule revisions are not acceptable to the City, then the City's comments shall form the basis for resubmission of Principal Project Company's proposed recovery schedule

1.2.1.5. Project Schedule Monthly Updates

A. Principal Project Company shall prepare and submit to the City Project Schedule Monthly Updates to reflect actual progress and to define future activities. The last day of each monthly reporting period shall be the data date used to calculate the schedule.

B. The current Project Schedule shall be the basis for monthly updates, which shall:

1. Show activities that have started, are on-going, or have completed during the reporting period.
2. Show actual start and finish dates for activities.
3. Show remaining duration for on-going activities, with remaining duration based on updated determinations of the amount of time required to complete the work activity.
4. Modify activity relationships or otherwise re-baseline the currently established Project Schedule only as necessary to correct out-of-sequence progress for on-going activities or to accurately reflect Principal Project Company's plan for completing remaining Work.

5. Be accompanied by a narrative report, which shall:
    a. Identify the Project Schedule version.
    b. Provide a summary of, and reasons for, revisions and deviations (if any).
    c. Identify milestones.
    d. Include started activities for the period.
    e. Include completed activities for the period.
    f. Explain missed activity starts for the period.
    g. Explain missed activity completions for the period.
    h. Discuss critical resources.
    i. Describe the critical path.
    j. Identify near-critical activities (total float less than nine Days).
    k. Describe any pending Time Impact Analysis (TIA).
    l. Describe Project issues encountered.
    m. Identify potential changes from the original accepted Baseline Schedule (and last accepted update thereof).
    n. Describe impacts to current period activities.
    o. Highlight upcoming Project-related the City and Third Party activities within the next six months.
6. Include the following reported schedule data in supporting tables:
    a. Critical Path.
    b. Added activities.
    c. Deleted activities.
    d. Added predecessors.
    e. Revised relationship lags.
    f. Deleted predecessors.
    g. Revised original durations.
    h. Revised activity names.
    i. Changed calendars.
    j. Activities started during the period.
    k. Activities completed during the period.
    l. Near-critical activities (total float less than nine Days).
    m. Activities scheduled but not started during the period.
    n. Activities scheduled but not completed during the period. and
    o. Activities started or completed in the previous period.

C. Principal Project Company shall submit Project Schedule Monthly Updates properly coordinated with each Monthly Progress Status Report, as defined in Section 1.2.4.1 (Monthly Progress Status Report).

1.2.1.6. Submittal Schedule for D&C Submittals

A. Principal Project Company shall prepare and submit to the City a preliminary Submittal Schedule for the D&C Period, identifying design documents and showing dates by when all Submittals (documents, data, , samples, mock-ups, etc.) required by the Contract Documents will be submitted to the City and the appropriate AHJs. This preliminary submittal schedule shall be consistent with the required submittal dates in the Project

Schedule. The required submittal dates in the finalized Submittal Schedule shall be coordinated with the Project Schedule and any updates thereafter.

1.2.1.7. Look-Ahead Activity Reports

A. As an integral part of every Weekly Coordination Meeting defined in Section 1.13 (Weekly Coordination Meetings), a one-week look-back and two-week look-ahead schedule (also called a ”Three-Week Look-ahead Report”) shall be generated from the latest evaluation of actual progress based on each activity in the look-ahead schedule corresponding to an activity in the Project Schedule.

B. The Three-Week Look-Ahead Report shall show activities that occurred over the previous week and those necessary to meet the schedule over the ensuing two weeks. The report shall include, at a minimum, all activities planned to be performed during the look-ahead period. activities related to Project interfaces, the City-actions, and Third Party and Utility Owner coordination. and time-critical material deliveries.

C. The Three-Week Look-Ahead Report shall be a spreadsheet containing activity IDs and descriptions from the Project Schedule and include the following information: start and finish dates for these activities as they will be performed on Project Site showing the planned prosecution of the activity (with interruptions and resumptions of work), total float from the schedule current during that month, original duration, remaining duration, percent complete, and pertinent remarks as to activity status. The Three-Week Look-Ahead Report shall be submitted to the Construction Manager at least three days prior to the weekly meeting for review. Submit copies of Three-Week Look-Ahead Report on 11 inch by 17 inch paper. The look-ahead must indicate which activities are on the critical path.

D. During each Weekly Coordination Meeting, the Three-Week Look-Ahead Report shall guide attendees’ discussion and review of activities, whether planned or ongoing.

1.2.2. Schedule Requirements

A. The Project Schedule, in all its forms, shall comply with the Contract Documents and shall be consistent with project planning and scheduling best practices. The Project Schedule shall, at a minimum, conform to the requirements in the following subsections:

B. Include a written narrative that explains the approach for meeting all milestones and Contract Deadlines. The narrative shall include a clear description of the critical path activities from beginning to end. The narrative shall set out the schedule basis and assumptions, including determining activity durations used to develop the critical path network and methodology for resource loading.

C. Include activities that meet the following minimum requirements:

1. Activity durations shall be the total number of actual days required to perform the activity, including consideration of normal weather impact on completion of the activity.
2. Activity durations shall be based on anticipated production rates for design and preconstruction activities, labor (crafts), equipment and materials required to perform each activity on a normal workday basis.
3. Each activity shall have one predecessor and one successor (excluding the Project start and finish milestones).

4. All activity names shall be clearly and uniquely named with a description of Work readily identifiable to inspection staff. Each activity shall have a descriptive label consisting of at least one action or work function such as submit, form, place, excavate, etc.. an object such as design calculations, slab, concrete, foundation, etc.. and location such as gridline, sector, building, etc..

D. Include all major activities of the Work in sufficient detail to enable the City to monitor and evaluate design and construction progress from Financial Close through Final Acceptance.

E. Become the basis for standalone, partially delineated schedules as may be required by Third Party and Utility Owner Agreements.

F. Utilize the critical path method of network calculation, the most critical path being the longest network path through the Project having the least amount of float.

G. Utilize the precedence diagram method to establish relationships and interdependencies between the individual activities required to complete the Project, subject to the following:

1. Total float criteria are not acceptable for identifying or representing the Critical Path; and
2. The scheduling software shall be configured to show the longest path in any schedule calculation. and graphical representation shall distinguish between the critical path and near-critical paths.

H. Be resource-loaded, inclusive of labor resources, equipment resources, and any limitations or restrictions on resources.

I. Ensure that activity identification numbers, textual descriptions, and codes are consistently applied and have unique descriptors for each activity.

J. Breakdown the D&C Work throughout the D&C Period into measurable performance activities, with appropriate logic ties, to show that:

1. Overall approach to sequencing is efficient and effective;
2. Logical relationships between activities reflect the actual intended sequence of Work;
3. Design activities are appropriately matched to deliverables and completion of the activities, subject to the City approval of those deliverables;
4. No construction activity is greater than 10 working days in duration (except those activities relating to procurement, manufacturing, fabrication, shipments, submittals, and review cycles), subject to the City pre-approval of any exceptions;
5. No open-ended activities (i.e. those activities without their predecessors and successors identified) occur other than Early Work Start, Financial Close, NTP 1, Project Start, Substantial Completion, and Final Acceptance; and
6. No constraint dates begin or complete any activity unless particular constraint dates are specifically required in the Contract Documents or are explicitly accepted by the City.

K. Use no relationships that cannot be shown to demonstrate a true dependency.

L. Show any required City, Third Party and/or Utility Owner activities and milestones including, at a minimum, installation of City-furnished FF&E, procurement milestones (such as product delivery dates), right-of-way/right-of-entry availability, and Project elements that interface with Related Projects (see Section 1.14.2).

M. Show phasing of the Work including procurement, fabrication, delivery, installation, testing of materials and equipment, commissioning of systems, and any long-lead time orders for major or significant materials and equipment.

N. Identify all required regulatory approvals, allow reasonable durations for acquiring approvals and dates by which such approvals are needed to avert delays.

O. Incorporate the availability and unavailability of various Rights-of-Way/Rights of Entry and temporary easements necessary to facilitate field construction ("TCEs").

P. Minimize use of leads and lags, with any leads and lags subject to the City approval.

Q. Use retained logic methodology for schedule calculations.

R. Exhibit no float sequestering or float suppression techniques, as no scheduled activity shall exhibit negatively valued total float.

S. Include printed calendar report(s) with every schedule submission. The schedule's global calendar shall reflect workweeks of seven 24-hour days without holidays or non-work days.

T. Take into consideration potential construction delay due to Adverse Weather and include, at a minimum, 17 days per year for the anticipated number of days of Adverse Weather as stipulated in Section 14.1.8.2 of the Agreement.

1.2.3. Scheduling System

A. Principal Project Company shall utilize the latest version of Primavera Project Management (P6, or later, for Windows) software running on a hardware system commensurate for the size and complexity of the Project. This hardware and software, working together, shall be called the "Scheduling System", and shall be capable of handling, processing, printing and plotting data to satisfy requirements set forth in the Contract Documents.

B. Principal Project Company shall continuously maintain the Scheduling System and the Project Schedule. Principal Project Company shall ensure the scheduling software maintenance agreement(s) remain current until Final Acceptance.

C. Each schedule submitted by Principal Project Company, or by any person or firm employed by Principal Project Company, shall be in native .xer format with textual schedule reports accompanying each schedule submittal in both hard copy and electronic ".pdf" forms.

1.2.4. Performance Reporting

1.2.4.1. Monthly Progress Status Report

A. Principal Project Company shall prepare and submit to the City a Monthly Progress Status Report, from NTP2 to Final Acceptance, with agreed content and formatting, that contains information on Principal Project Company's performance of Work during the previous calendar month. At a minimum, each such report shall contain:

1. Work-completed reports (and marked-up work-completed reports, as necessary) for the reporting period, description of Work planned for the next reporting period, and a summary of any critical issues or decisions affecting the Work.

2. Report shall have a subsection for each of the following that shall address progress, risks, mitigations and corrections for:
    a. Project Schedule.
    b. Quality.
    c. Safety and security.
    d. Environmental compliance and permitting.
    e. Third Party and Utility coordination.
    f. Traffic detours and maintenance of traffic.
    g. Inclusivity.
    h. Public outreach.
    i. Submittals and review process.
    j. Design progress tracking, and design modifications and other changes in scope.
    k. Interface management.
    l. Operational readiness planning and coordination.
    m. Other pertinent and timely discussion topics.
3. Description of environmental issues that arose within the Project Site (or work sites relating to the Project) and their resolution or current disposition.
4. Description of safety and security issues that arose within the Project Site (or work sites relating to the Project) and their resolution or current disposition.
5. Description of incremental and cumulative progress made towards the achievement of Disadvantaged Business Enterprises participation compared to planned levels of such Inclusivity participation.
6. Listing of Nonconforming Work, whether self-reported or identified by the City, and/or corrective actions and their resolution or current disposition.
7. Providing a copy of the latest Noncompliance Database, noting any new assessment of Noncompliance Points in the previous month, and generally reporting on the D&C requirements contained in Article 15 (Deductions and Noncompliance Points) of the Agreement.
8. For the Final Monthly Progress Report addressing the D&C Period, Principal Project Company shall update all information and incorporate such information into an As-Built Schedule, as defined in Section 1.2.5, for purposes of closing out the D&C Work.

1.2.5. As-Built Schedules

A. Principal Project Company shall prepare and submit to the City for review and comment a Final Schedule Report, which shall provide the last Revised Project Schedule, an overview of the Project Schedule process, the history of changes to the Project Schedule, resulting effects on contractual dates, if any, and any outstanding schedule issues.

1.2.6. Time Impact Analysis for Proposed Extensions of Time

A. Principal Project Company shall submit a detailed Time Impact Analysis (TIA) to support all requests of claims for extension to any Contract Deadline.

B. The date upon which the Relief Event or Force Majeure Event occurred shall serve as the basis for each TIA or, in the event of a proposed Change Order, the implementation date of the proposed Change Order.

C. Each TIA shall show a current status of the Work using the Project Schedule or Revised Project Schedule, as the case may be, and corresponding Performance Monitoring Report prior to the initiation of the events resulting in the claim for an extension of any Contract Deadline. The TIA shall show all affected activities together with a demonstration of actions deployed by Principal Project Company to mitigate any impacts to a Contract Deadline.

D. Each TIA shall include a fragmentary network schedule (most commonly called “fragnet”) demonstrating how Principal Project Company proposes to incorporate the quantifiable time impact into the most recent Project Schedule update prior to the initiation of events in-question. The fragnet is subject to the same requirements controlling activities in the Project Schedule, including resource information for added scope and assignment of activity codes and appropriate work breakdown structure, whether existing or amended.

E. With regard to each fragnet relating to a Relief Event or Force Majeure Event, Principal Project Company shall:

   1. Demonstrate that recalculation of an activity or activities duration based on quantities, with resource loading and productivity ratios for the fragnet activities, as well as the scheduled activities that were affected and impacted by delay, are justified.
   2. Identify the predecessors to new activities demonstrating the impacts caused to successor activities.
   3. Insert fragnet into the most recent Project Schedule update prior to the start date of the alleged Relief Event or Force Majeure Event.
   4. Run the schedule calculations and submit the impacted Project Schedule as required by the Contract Documents. and
   5. Include a narrative report describing the effects of new activities, resources and relationships to Contract milestones and the applicable Completion Date with each TIA.

F. A submitted TIA can be accepted when Principal Project Company proves one or more of these conditions justifiable to the City:

   1. When a Change Order affects the completion date or sequence of items of the Work.
   2. When the City directs a change that affects the milestone date(s) specified in the Contract or alters the length of a critical path.

G. Principal Project Company, or any person or firm employed by Principal Project Company, shall submit each TIA in .xer file format, to the City for examination, evaluation and consideration.

H. After obtaining formal acceptance by the City, Principal Project Company shall incorporate the accepted TIA into the next Project Schedule update. Principal Project Company shall incorporate, and include as an attachment to the corresponding Change Order, any TIA related to a Change involving an extension to a Contract Deadline.

1.3. SUBMITTAL MANAGEMENT

A. Each Submittal provided to the City shall include sufficient detail to demonstrate that Principal Project Company understands and is fully responsive to, and compliant with, the specific requirements of the Contract Documents addressed in that Submittal. Submittals shall be logically organized and clearly presented, and shall be compliant with the requirements of Article 5.1 (Submittal Review Terms and Procedures) of, and Exhibit 11 (Submittals Review Process) to, the Agreement.

B. The content of Submittals to be provided to AHJs, Third Parties, and Utility Owners for their review and/or approval shall be as required by the applicable regulations, codes, Third Party agreements, and Utility Owner agreements, consistent with the respective Project Execution Plans, as applicable.

C. Exhibit 18, Division 1 Appendix B (Initial List of Submittals) provides the minimum requirements for technical submittals during the Term. Principal Project Company shall expand and submit to the City the List of Technical Submittals as further defined in Exhibit 11 (Submittals Review Process) to the Agreement.

1.4. QUALITY MANAGEMENT

A. Principal Project Company is responsible for effectively managing quality and assuring quality results in each phase and element of the Work.

B. Principal Project Company's Quality Management processes and procedures shall be independent of its management and oversight of Project scope, schedule, budget, and production activities. Acting independently, Principal Project Company's Quality Management team shall provide status reports on non-compliance actions and results of quality reviews and audits, and documentation related to achieving major schedule milestones.

1.4.1. Principal Project Company Quality Program

A. Principal Project Company shall document, implement, and maintain an effective Principal Project Company Quality Program (PQP) that guides processes to manage, control, document, and ensure that all aspects of the Work comply with requirements of the Contract Documents. The PQP shall apply to all Work performed by Principal Project Company, its Contractors, Suppliers and Vendors, as applicable.

B. The PQP shall contain processes and procedures necessary to ensure complete quality assurance and quality control for the following major activity categories: design, design and constructability reviews, energy modeling and other sustainability verifications, materials, equipment, inspections, testing, construction, performance demonstration, coordination, workmanship, fabrication, and document control for on-site and off-site Work performed by Principal Project Company. Multiple volumes shall be compiled separately addressing Project Management, Design and Construction, and Operations and Maintenance.

C. The processes and procedures established under the PQP shall comply with ISO 9001 requirements and, at a minimum, the following elements:

Element 1: Management Responsibility

Element 2: Documented Quality Management System

Element 3: Design Control

Element 4: Document and Data Control

Element 5: Purchasing

Element 6: Control of Third Party Supplied Items

Element 7: Product Identification, Availability, and Traceability

Element 8: Process Control

Element 9: Inspection and Testing

Element 10: Control of Inspection, Measuring and Test Equipment

Element 11: Inspection and Test Status

Element 12: Control of Nonconforming Work

Element 13: Corrective and Preventive Action

Element 14: Control of Quality Records

Element 15: Quality Audits

Element 16: Training

D. Principal Project Company shall require and cause the preparation and adoption of separate, formalized quality programs by each Principal Project Company-Related Entity, coordinated and consistent with requirements in the PQP. The quality assurance and quality control obligations for which Principal Project Company is responsible shall extend to Work performed by Contractors and Subcontractors.

E. Principal Project Company shall comprehensively document the PQP in the Principal Project Company Quality Program Plan (PQPP). Principal Project Company shall submit to the City for review and acceptance prior to submitting any Design Documents or commencing any field activities. Principal Project Company shall submit to the City all subsequent updates to the PQPP.

F. The PQPP shall include an organization chart showing names, titles, responsibilities, authority, and the interrelationship between those involved in managing and directing the PQP. Principal Project Company's Quality Program Manager (QPM) shall be responsible for managing and overseeing the overall program and its preparation and implementation, including updates thereof. The PQP shall establish a Quality team that is distinct and independent from Principal Project Company's design and construction production organizations. Members of the Quality team shall inform the City's quality oversight personnel, as appropriate, and shall report directly to the QPM who, in turn, reports directly to Principal Project Company's senior management team.

G. The PQPP is subject to revision, and both Principal Project Company and the City may identify the need for such revisions. Principal Project Company shall update content to reflect current circumstances and changes in conditions as the Work progresses. Principal Project Company shall submit any such revisions or updates no later than each anniversary of the initial submittal of the PQP. Principal Project Company shall then redistribute a conformed PQPP, with revisions highlighted, in accordance with the requirements herein.

H. The initial PQPP must address all D&C Work. An updated PQPP must be submitted to the City for review and acceptance

1.4.1.1. Management Responsibility

A. Principal Project Company shall define and document a quality policy that includes objectives for the Project and shall communicate, implement, and maintain that policy at every level of its organization.

B. Principal Project Company shall publish a statement of its commitment to quality and its organization's quality objectives. The stated commitment shall explain Principal Project Company's means to attain quality results in the completed Work, how such commitment extends to all Project staff, and a signed copy of such management commitment shall be included in the PQPP.

1.4.1.2. Documented Quality Management System

A. Principal Project Company shall establish, submit necessary documentation to the City, and maintain a highly documented Quality Management System (QMS) to ensure that Project-specific quality goals and objectives are satisfied. The QMS requirements shall extend to Principal Project Company's entire organization and Principal Project Company's management and oversight of quality assurance/quality control shall be independent of Principal Project Company's management and oversight of design and construction production, and subsequent operations and maintenance activities.

B. The QMS shall define the interface between Principal Project Company's quality organization and its design and construction organization, and subsequent operations and maintenance organization, and shall be in writing to ensure that employees have a full understanding of how the QMS works. Principal Project Company shall fully document and report to the City all Nonconforming Work, as required in Section 1.4.1.9 (Control of Nonconforming Work), and Corrective Actions, as required in Section 1.4.1.10 (Corrective and Preventive Action).

C. The QMS shall contain a statement of its purpose and scope, and shall include references to appropriate codes, standards, and specifications. The QMS shall identify any inspection equipment, skills, or special quality processes needed to ensure quality performance. The QMS shall contain formats for the quality records and related documentation. .

1.4.1.3. Design Control

A. Principal Project Company is solely responsibility to provide Design Documents in accordance with the Contract Documents and the approved PDQP, as defined in Section 1.4.2 (Principal Project Company Design Quality). City's review of the Design Documents is proprietary in nature and does not relieve Principal Project Company of the responsibility to meet all obligations and requirements of the Agreement and Authorities Having Jurisdiction.

B. During development of Design Documents and the PDQP, Principal Project Company shall incorporate respective designers' quality control provisions and references into the PDQP. Principal Project Company shall establish and maintain procedures to ensure conformance with the Contract Documents, and with applicable requirements of AHJs, Third Parties, and Utilities Owners. Principal Project Company shall ensure designers have a clear understanding of the applicable requirements, properly coordinate design interfaces, plan and execute design validation and conformance verification activities, and implement effective design control processes and procedures, to control changes in the design throughout the entire D&C Period.

C. Design control applies to computer programs, design tables, calculations, graphs, and any other work products used to analyze results in developing or checking proposed designs.

D. The PDQP shall include procedures on how changes in design are to be initiated, reviewed and approved, implemented, inspected and documented, shall define a process to provide effective configuration management/control, and shall identify those individuals or persons authorized to approve such changes in design. An approved PDQP must be established and followed prior to any submission of Design Documents to the City.

1.4.1.4. Product Identification, Availability, and Traceability

A. Principal Project Company shall establish, submit to the City, and implement documented product identification, availability and traceability procedures for identifying and controlling the provision of any items of production (such as batch, materials, parts, and components) for incorporation into the Project. Effective measures shall prevent the use of incorrect or defective items and shall ensure the use or incorporation of only correct and acceptable items. Principal Project Company shall submit to the City, in a complete and timely fashion, formal product identification procedures, for application from receipt through all stages of production, delivery, and installation.

1.4.1.5. Process Control

A. Special processes, including welding, nondestructive testing, and heat treatment, the results of which cannot be directly verified by subsequent inspection and testing of the product, shall be continuously monitored by Principal Project Company during the process to ensure required quality results in the final product.

1.4.1.6. Inspection and Testing

A. Principal Project Company shall plan and implement inspection and testing procedures as necessary to verify product or production quality. Inspection and testing shall follow formal procedures, with documented results, before receiving incoming products for final inspection, verification, and testing for acceptance. Testing requirements and procedures shall include references to required certifications, testing procedures, frequency and location, requirements for witnessing of tests, and where factory inspection and/or testing is necessary prior to shipping or transporting the finished product.

B. Principal Project Company is responsible for performing all quality assurance and quality control inspections and tests under the Contract Documents. The PQP shall address the required certifications, inspections, and tests, and the establishment of quality records, in appropriate detail.

C. Principal Project Company shall provide a means for identifying the inspection and test status of Work during production and installation. Only products or installed Work that has passed the required inspections and tests may be accepted.

1.4.1.7. Control of Inspection, Measuring, and Test Equipment

A. Inspection, measuring, and test equipment (including test software) necessary to perform inspection and testing shall be identified, controlled, calibrated, and maintained appropriately, to demonstrate the conformance of work to the specified requirements.

B. Principal Project Company shall submit to the City a Schedule of Testing Equipment identifying all equipment that needs periodic and regularly scheduled recalibration, including date of initial calibration, schedule for recalibrations, and current calibration status. Principal Project Company’s Quality Assurance personnel shall ensure the schedule is current by audit. Principal Project Company shall provide the associated schedule of updates and audit reports to the City’s Quality Assurance personnel upon request.

1.4.1.8. Inspection and Testing Status

A. Conformance or nonconformance of any Work items shall be identified through inspection and testing by suitable means. Principal Project Company shall ensure all Work items have passed their requisite inspections and tests and shall report such status throughout all production, installation, and servicing processes.

1.4.1.9. Control of Nonconforming Work

A. Principal Project Company shall submit to the City and implement procedures to prevent the use, installation, or allowance of Nonconforming Work in the Work.

B. Principal Project Company shall identify, document in the Noncompliance Database, and evaluate the root cause of every instance of Nonconforming Work as per Section 15.3 of the Agreement.

1.4.1.10. Corrective and Preventive Action

A. Principal Project Company implement the corrective actions needed to correct each instance Nonconforming Work, prevent recurrence, and analyses to detect and eliminate potential Nonconforming Work.

B. Principal Project Company shall verify accomplishment of corrective actions to the City's satisfaction. Principal Project Company shall develop and implement preventive actions to mitigate or eliminate potential Nonconforming Work or otherwise prevent occurrence/recurrence of Nonconforming Work. Such prevention includes implementing and recording changes in procedures resulting from preventive actions, corrective actions, and continual quality improvement initiatives.

1.4.1.11. Control of Quality Records

A. Principal Project Company shall establish, submit to the City, and implement effective procedures for organizing, maintaining, and safekeeping Quality Records, both in hard copy and electronic forms. The procedures shall identify those Project-related records for safekeeping, responsibility for production and collection of such records, and responsibility for indexing, filing, storage, retrieving, and other disposition of Quality Records.

B. Quality Records shall demonstrate conformance to specific requirements and contribute to effective operation of the QMS. Principal Project Company shall maintain, and be able to produce records necessary to provide objective evidence of Agreement review, procedure compliance, design review, training, demonstration, certification, and complete acceptance of inspection and test results, including traceability of equipment or items used in the Work.

C. Quality Records shall be legible and shall be stored and retained in a manner that is readily retrievable, housed in locally accessible facilities that provide a suitable environment to prevent damage or deterioration, and secured to prevent loss or unauthorized access.

D. Quality Records shall always be available to the City, for examination or inspection, in accordance with the Contract Documents, in which their retention periods and storage medium shall be as specified, consistent with the PQP and the Contract Documents.

1.4.1.12. Quality Audits

A. Principal Project Company shall establish, submit to the City, and follow documented procedures for planning and implementing a comprehensive program of scheduled and unscheduled Quality Audits, the Quality Audit procedures. Quality Audits shall verify compliance with applicable requirements and ensure that all elements of the QMS are functioning effectively.

B. Quality team personnel shall conduct Quality Audits on a planned and scheduled basis, commensurate with the importance of the activities being performed, but no less frequently than every quarter throughout the Term. The Quality team shall initiate Quality Audits early enough in the life of the activity to assure effective Quality Control throughout the activity's timeframe. Quality Audits shall encompass project management, supervisory and administrative functions, and performance of technical activities of the Work.

C. The results of Quality Audits shall be fully documented, recorded, and reported to those persons and firms having direct responsibility in the Work area audited. Principal Project Company shall immediately instigate timely corrective action of any deficiencies noted in the Quality Audit.

D. Principal Project Company's personnel conducting a Quality Audit shall be independent and separate from those directly responsible for performing the activity audited. Qualifying experience and credentials (such as ASQ certification) for an Auditor shall be established and documented by Principal Project Company, with such personnel qualification records kept on file, maintained in the Quality Records, and available to the City.

1.4.1.13. Training

A. Consistent with the provisions in Section 1.7 (Training), Principal Project Company shall establish, submit to the City, and follow written procedures for identifying training needs and providing training to all Quality Assurance/Quality Control personnel for activities affecting quality in the Work and in accordance with the Contract Documents.

B. Records of training and certifications shall be maintained in the Quality Records, and be available to the City, identifying certification of personnel performing specific assigned tasks. Such certification shall be based on appropriate education, training, and experience.

C. Principal Project Company shall document its training procedures and maintain current training records to ensure only qualified personnel are performing quality related activities and assigned tasks. Principal Project Company shall prepare training procedures through ongoing training efforts and the recorded accumulation of personnel experiences, including systematic reviews of personnel competence at determined levels before any deployment in new quality-related roles. Such training shall focus on improving competency and skill levels for those performing activities affecting quality in the Work.

1.4.2. Principal Project Company Design Quality

A. Principal Project Company shall prepare and submit to the City for review and acceptance a Principal Project Company Design Quality Plan (PDQP) addressing Principal Project Company's responsibilities for performance, oversight, and verification of all Design Work. The PDQP shall tier off from the PQPP to specifically address the design process. No Design Work may commence until the City verifies that the submitted PDQP complies with the requirements of Contract Documents and is deemed acceptable to the City.

B. Principal Project Company shall require and cause the preparation and adoption of separate, formalized design quality plans by each design firm engaged by Principal Project Company, coordinated and consistent with requirements in the PDQP.

C. The Design Manager and the QPM shall administer the design management and quality oversight responsibilities for which Principal Project Company owes a duty of care to the City.

1.4.2.1. Design Documentation

A. Principal Project Company shall prepare, submit to the City, and maintain a Design Progress Tracking Report that includes engineering and design progress against the design activities in Project Schedule and as required by Section 1.8 of this Division 1, as well as any design work related to Changes or Deviations.

B. The Design Manager shall submit to the City a Monthly PDQP Report for information purposes at the same time as Principal Project Company's Monthly Progress Status Report to, at a minimum, address:

1. Summary of design reviews conducted;
2. Any design activities related to Nonconforming Work; and
3. Updated list of Principal Project Company's internal and external design submittals, for reference (as such documents are cited in the PDQP).

C. Upon completion of Design Documents per the Proprietary Design Review process (see Section 1.8.5 of this Division 1), the Design Manager or QPM shall notify Principal Project Company's project management and design team members, with a copy to the City, of any outstanding issues or unresolved review comments. Outstanding issues or unresolved review comments shall also be noted in the final Design Progress Tracking Report. Principal Project Company shall revise the final Design Progress Tracking Report to incorporate responses to the City's comments and resubmit to the City within 15 Days of receipt of comments.

D. To facilitate determination of Quality Assurance sampling and testing needs, Principal Project Company shall quantify key items of the Work subject to sampling and testing, and presented in measurable units that facilitate sampling and testing. Principal Project Company shall submit to the City its quantity estimates prior to commencing the relevant construction activity.

E. BIM formatting for Design Documents, design submittals, and As-Built Documents shall conform to the BIM requirements herein and the requirements of the applicable AHJ.

1.4.2.2. Design Quality Records

A. Principal Project Company shall maintain an auditable record of PDQP procedures, reviews and checks. Notwithstanding the City's right to audit, an auditor independent of Principal Project Company's management and production teams shall be able to determine, and verify by reviewing pertinent documentation, that Principal Project Company is following quality procedures included in the PDQP.

B. Principal Project Company shall enter instances of Nonconforming Work relating to Design Work into the Noncompliance Database in accordance with Section 15.3 of the Agreement.

1.4.2.3. Design Quality Assurance

A. The QPM shall certify to Principal Project Company and to the City that the design process activities and Design Work products comply with the approved PDQP and other Contract Documents..

B. Performance of design quality assurance shall in no way relieve the Design Manager, EOR(s) or AOR(s), or other design firm(s), from their respective responsibilities to check and review the quality, content, and correctness of Design Work produced for the Project. Each of the responsible design firms and responsible professionals performing these checks and reviews shall document their efforts, forwarding such evidence to the Design Manager and QPM, such that notes of checks and reviews are maintained as Quality Records.

1.4.3. Principal Project Company Construction Quality

A. Principal Project Company shall prepare and submit to the City for review and acceptance a Principal Project Company Construction Quality Plan (PCQP) defining the processes and approach that will be implemented to ensure compliance with the requirements herein. The PCQP shall tier off from the PQPP to specifically address the construction process. No permanent Construction Work, except for site demolition, grading, and other preparatory activities, may commence until the City verifies that the submitted PCQP complies with the requirements of Contract Documents and is deemed acceptable to the City.

1.4.3.1. Quality-in-Construction Organization

A. Principal Project Company shall organize a Quality-in-Construction (QIC) program to oversee, manage, certify, and perform construction related quality activities including preparation of the PCQP and managing and scheduling all quality assurance/quality control inspections, sampling, and testing of Construction Work items.

B. The Quality Program Manager shall be responsible for overall management and supervision of Principal Project Company's QIC program, which duties shall include coordinating the daily schedules of the field inspectors, testers, and samplers involved in ongoing design or construction activities.

C. The PCQP shall include formal training procedures that provides Project-specific quality/safety and security orientation and clearly defines the education, previous experience, and training requirements applicable to all personnel assigned to Principal Project Company's QIC organization. The training procedures shall include evaluating each candidate's knowledge of the PQPP, QMS, PDQP, and PCQP.

D. QIC staff shall act independently from those responsible for and involved in the production of construction materials or the progress of Construction Work.

E. Principal Project Company shall utilize independent testing laboratories to conduct all laboratory-based and field-based testing in compliance with statutory requirements for Independent Testing Laboratory (ITL) certification and specific requirements for the City certification for applicable tests. Principal Project Company shall submit to the City candidate ITL credentials and the City reserves the right to reject any candidate ITL proposed by Principal Project Company or revoke prior ITL certifications, in the City's sole discretion, at any time. Recognized ITL accreditations shall include the AASHTO Material Reference Laboratory, the Concrete Cement Reference Laboratory, the National Precast Concrete Association, the Prestressed Concrete Institute, the American Association for Laboratory Accreditation, and/or the National Voluntary Laboratory Accreditation Program, as appropriate and approved by the City.

F. Principal Project Company's ITL shall provide written policies and procedures to assure portable and satellite laboratories performing testing activities on the Project are capable of providing testing services in compliance with the applicable test methods. These policies and procedures shall address continual inspection and calibration of testing equipment as well as an established correlation-testing program between the accredited ITL and their portable or satellite facilities.

1.4.3.2. Construction Control

A. The PCQP shall contain procedures and policies to detect and prevent the reoccurrence of Nonconforming Work or other deficiency.

1.4.3.3. Material/Equipment Certifications

A. Principal Project Company shall submit a source of supply and item material/equipment types report, for the City's information, as follows:

1. Initially, within either 30 Days prior to material/equipment use or 60 Days following Financial Close, whichever is the earlier, to the extent that information is known. and

2. For materials/equipment not initially identified, or changes to an initial source provided, the actual source of supply shall be identified as soon as known, but not less than 30 Days prior to delivery of relevant materials/equipment to the Project Site.

B. Documented evidence that materials and equipment conform to requirements of the Contract Documents shall be available for the City's inspection, at the Project Site, prior to installing or using such materials and equipment. Principal Project Company shall maintain such evidence (the "Material and Equipment Conformance Certifications") at the location of placement or secured storage, with definitive content sufficient to identify these specific requirements and to certify compliance, such as working drawings, codes, standards, or the Technical Provisions. Substitutions of specified materials or equipment shall not occur without prior written approval by the City, notwithstanding a consenting determination of the responsible AOR or EOR. Failure to obtain prior formal approvals of a substitution will result in a finding of Nonconforming Work and the City's rejection of the unsatisfactory work containing such nonconforming material or equipment. City reserves the right to audit and review these certifying documents at any time.

C. Principal Project Company shall submit to the City, as soon as Principal Project Company receives documented evidence, a Source of Supply Certificate of Compliance, signed by both the Project Manager and CQCM, indicating that sourced materials and permanent equipment incorporated into the Work conform to the requirements of the Contract Documents.

1.4.3.4. Process Control

A. Principal Project Company shall establish and implement policies and procedures, as documented in the PCQP, for controlling key processes associated with construction.

B. Principal Project Company shall initiate Quality Check Points (QCPs) at appropriate stages of construction progress to ensure that trade Work is being performed in accordance with approved Design Documents, consistent with the PQPP and the PQCP, and satisfying the requirements of the Contract Documents and Good Industry Practice. Principal Project Company shall request Code-mandated structural observations and documentation of each visit by the responsible AOR or EOR (or his/her designee). Concrete pours shall routinely require a “pour card” evidencing that those inspecting the Work on behalf of the permittee and the AHJ have certified by their signature that the Work is correctly prepared and ready to receive placement of concrete.

C. Throughout the course of Construction Work, the Construction Manager, together with the responsible AOR(s) or EOR(s) shall periodically, but not less than monthly, meet with the City representatives to review quality control documentation and procedures including, at minimum, material certifications, daily inspection records, material testing results, survey results, permits, and material placement records.

1.5. EXISTING CONDITIONS

A. Principal Project Company shall ensure that the physical condition of existing buildings, structures, roadways, sidewalks, paths, trails, lighting and signal equipment, or other property that are to remain in place or are to be modified, are not adversely affected by the performance of the Work. Principal Project Company shall perform appropriate property/pre-construction surveys to document existing conditions in order to establish an adequate mapping of baseline conditions, as well as subsequent monitoring to record any variance in baseline conditions. Principal Project Company is solely responsible to protect in place certain property and shall repair or replace any property damage caused by construction of the Work. Principal Project Company shall submit to the City copies of these surveys prior to commencing any construction activity in the affected worksite location(s).

1.5.1. Pre-Construction Information, Pre- and Post-Construction Surveys

A. At a minimum, Principal Project Company shall perform Pre-Construction and Post-Construction Surveys, detailing the ‘before’ and ‘after’ condition of all roadways, site features, above ground utilities, and other relevant information. Surveys shall include written documentation of pre-existing conditions and final conditions supplemented with video or still photographic documentation.

B. After completing construction of the Project, or portions thereof, Principal Project Company shall perform a post-construction survey for each facility documented in the corresponding preconstruction survey. The post-construction surveys shall highlight any changes in the condition of the facilities surveyed prior to construction, including any new property damage.

C. Principal Project Company’s Project Schedule shall include planned dates and actual dates for these preconstruction and post-construction surveys to ensure that facilities are surveyed prior to starting and after completing any construction activity that could affect a surveyed facility. Principal Project Company shall complete preconstruction surveys no later than 20 Days before commencing fieldwork, and post-construction surveys no later than 120 Days after completing any work located within 200 feet of the existing building, roadway, Utility, or facility.

D. Principal Project Company shall employ an independent professional services firm specializing in land surveying and mapping practices, with no less than 10 years of qualifying experience in similar work to perform physical damage assessments of buildings and structures. A preliminary assessment of damage potential and possible displacements induced by construction of the Project, including calculations, is applicable to all structures and utilities located within 200 feet from the Project Site. Empirical methods may be used to determine magnitude and directions of ground displacements and construction-induced vibrations. The specialist/firm shall develop risk categories based upon maximum induced settlement, maximum induced slope, and descriptions of probable damage. Each building, roadway, utility, and facility within 200 feet from the D&C Limits shall be so categorized.

E. Principal Project Company’s architects/engineers shall conduct in-depth analyses, by numerical methods, to consider the potential construction effects on all buildings, structures and utilities of which the specialist/firm has categorized “greater than negligible”. Principal Project Company shall submit to the City the proposed method of analysis to address damage potential by ground movement, groundwater drawdown, and vibration effects.

1.6. INFORMATION MANAGEMENT

A. Principal Project Company shall establish and submit to the City procedures to produce and control all documentation and relevant information, the Information Management Plan (IMP), including data stored in electronic media.

B. The IMP shall specify a process for delivery of documents and information to the City, such as use of a sharepoint or central repository that is setup and managed by Principal Project Company.

C. Principal Project Company shall establish and maintain documented procedures to control the formal process for reviewing and commenting on Submittals, resolving and closing outstanding reviewer comments, and assigning approval authority.

D. At a minimum, such relevant documents shall include Release for Construction Documents (RFCDs), Current Status Documents (as defined in Section 1.6.3, Item C), and other Record Documents, including:

1. Contracts.
2. Change Orders.
3. Budgets.
4. Work Plans.
5. Procedures.
6. Reports.
7. Registers and Logs.
8. Meeting Agendas and Minutes.
9. Design Deliverables.
10. Drawing plans and specifications; design, current and As-Built Documents.
11. Regulatory Approvals.
12. Submittals.
13. Certifications.
14. Third Party and Utility agreements.
15. Master drawing lists or equivalent documents.
16. Critical procedures and explicit work instructions.
17. Quality, Training, Equipment manuals and records.
18. Design data (e.g. computer databases, computer files, BIM/CAD files, energy model, etc.).
19. As Built Schedule.

1.6.1. Document Version Control

A. Principal Project Company shall include document version control procedures in the Information Management Plan. Document version control procedures shall be implemented to ensure that current versions of relevant documents are on file and readily available to authorized persons, upon request, and that current versions of Design Documents are available to the City without restriction at all times. Electronic document and hard copy distribution shall be controlled and follow the same protocols.

B. Principal Project Company shall review and approve for accuracy and adequacy all physical documents and electronic data prior to issue.

C. Effective document version controls shall ensure that:

1. Pertinent issues (and correct versions) of appropriate documents are available to Principal Project Company, the City, and Third Parties;
2. Invalid and/or obsolete documents are promptly removed from all points of issue or use, or otherwise quarantined against unintended use; and
3. A record of the then-current issue of the RFCD is available to be used.

1.6.2. Drawing and Engineering Data Changes

A. Principal Project Company shall delineate and establish its formalized workflow process for the initiation, review, and approval of changes to Design Documents prior to issuance of such design changes.

B. Any change to the Current Status Documents and associated data shall be reviewed and accepted by the same expert or authority (person, entity or AHJ) that performed the prior review and acceptance, unless specifically authorized by the Design Manager and QPM to be reviewed and accepted by another designated expert or authority (person, entity or AHJ). If review by the original authority is not possible, then the alternate reviewer shall have adequate background and experience upon which to base the determination regarding incorporation of the change. The alternate reviewer shall have access to pertinent background information upon which to base his/her pending review and acceptance action.

1.6.3. As-Built Documents

A. Principal Project Company shall prepare and submit to the City As-Built Documents that accurately and completely reflect the actual conditions and location of elements of the Work as constructed and installed, including drawings, specifications, and related documentation (such as engineering data and reports) that affirm the actual conditions and placement locations.

B. As-Built Drawings are an integral part of As-Built Documents and Principal Project Company shall produce As-Built Drawings in the same manner, scale and size as the original RFCD set.

C. Principal Project Company shall, at all times, maintain an up-to-date, marked-up set of RFCD plans, specifications, and pertinent shop drawings for the Work, including all details that vary from original depiction of the Work (“Current Status Documents”). The marked-up set of Current Status Documents shall include all formally issued revisions made after successive releases for construction.

D. Principal Project Company shall electronically modify the finally updated Current Status Documents to record actual construction where different from the original RFCDs and approved Shop Drawings.

E. Finally updated Current Status Documents shall not to be construed as official As-Built Documents until the responsible AOR or EOR has generated an updated edition of these final construction documents, each sheet labeled “As-Built Documents” and by incorporating all such markups recorded on all previous editions of RFCDs. Such As-Built Documents shall be prepared consistent with the City’s published CADD standards. The responsible AOR or EOR shall sign and seal the As-Built Documents.

1.7. TRAINING

A. Principal Project Company shall establish and maintain a plan and management procedure for identifying training needs and for providing training to all personnel performing activities affecting safety or quality in the Work. Personnel performing specific assigned tasks shall be qualified based on appropriate education, training and/or experience. Principal Project Company shall maintain appropriate records of training and current certifications.

B. Principal Project Company shall establish and submit to the City their plan for training procedures, materials, and records to ensure that the skills and professional judgment of their personnel are developed appropriately for their intended roles, through training and/or the recorded accumulation of experience with systematic reviews of their competence at determined levels, and before any deployment of new roles.

C. Training shall focus on improving individual competency and skill for those performing activities that materially affect safety and quality.

D. Principal Project Company shall document qualification and training records in the QMS, as part of the Quality Records.

E. Principal Project Company shall train Project personnel in all the special Project procedures applicable to their work.

F. Craft journeymen with special skills shall have their competency verified and a record maintained of such verification.

G. Principal Project Company shall provide Project-specific training for the City personnel as required for the City personnel to perform their designated Work functions. All equipment and systems required for the SFMTA O&M Services require training. Principal Project Company shall notify the City of the Project specific training date(s) and time(s) at least 21 Days prior to the scheduled training session. City will designate all the City personnel who need to receive training no less than 14 Days prior to the scheduled training session, including training required for access to the Project Site or related work sites of the Project.

H. For any the City personnel training required to support the IFM Period work activities pursuant to Division 7 (Asset Management Program Requirements) of the Technical Requirements, the City will designate such personnel no less than 28 Days prior to the scheduled start of such training.

1.8. DESIGN MANAGEMENT

1.8.1. Design Requirements

A. Principal Project Company shall produce Design Documents required by the Contract Documents, and as otherwise required, to complete the Project D&C Work, including the Joint Development Alternatives required by these Technical Requirements, and to operate and maintain the Project in accordance with the requirements of the Contract Documents.

B. Principal Project Company shall:

1. Manage and perform Design Work pursuant to the requirements of the Contract Documents, including provisions for the Joint Development Alternatives required in these Technical Requirements;
2. Manage and perform Quality Assurance and Quality Control for Design Work;
3. Manage, coordinate, and obtain necessary approvals and permits from Utility Owners, Third Parties, governmental authorities and regulatory agencies, and the City in their proprietary, not regulatory, capacity;
4. Ensure and certify that Design Documents are prepared by duly licensed design professionals working under the direct supervision of the Lead Designer;
5. Verify pertinent dimensions and other relevant existing field conditions prior to submission of any design document; and
6. Incorporate information regarding Allowances into the Design Documents and give the City time to review and comment and approve the final design pertaining to Allowance-related scope.

C. Design Documents are subject to review by the City, in their proprietary capacity, as well as Utility Owners, Third Parties, and AHJs in accordance with regulations, Governmental Approvals, and the applicable controlling documents, namely requirements set forth in Third Party Agreements, Utility Owner Agreements, Project Execution Plans, and the Contract Documents.

D. The Design Documents shall:

1. provide information customarily necessary in documents for projects of similar size, complexity, and quality; and
2. include all information required by the building trades to complete the construction of the Project, other than such details customarily developed by others during construction.

1.8.2. Integrated Design Process

A. Principal Project Company shall utilize an integrated process to design all elements of the Project in a synchronized, well-coordinated manner so that the Project is designed as an integrated whole and will function effectively and efficiently for its intended purposes, as well as supporting the Joint Development Alternatives required by these Technical Requirements.

B. Principal Project Company shall identify all requirements, including design, construction, operations and maintenance that apply to every element and component of the Project.

C. Principal Project Company shall address the highest-level performance requirements as matters of priority to determine their impact upon specified requirements for individual Project elements (or components).

D. Principal Project Company shall provide coordinated design management services inclusive of reviews and permitting by the City, Utility Owners, Third Parties, and AHJs. Principal Project Company shall demonstrate to the City that, through an integrated design process and each design submission, individual elements have been designed to integrate with the Project as a whole and support the Project's overall intended purposes.

E. Principal Project Company shall conduct independent design checks, workshops and over-the-shoulder meetings, consistent with the requirements of Section 1.8.1 (Design Quality Assurance Manager Review), to review individual design packages. Principal Project Company shall include in these reviews those individuals responsible for due consideration of Project interfaces, configuration control, safety and security, construction, operations, maintenance, and quality issues and concerns. City reserves its right to attend such design review meetings and may participate in discussions.

1.8.3. Design Document Organization

A. Principal Project Company shall organize the Design Documents, arranging them into a systematic order and identifying them with alpha/numeric designations based on discipline designations, locations, and sequential numbering of sheets and pages. Principal Project Company shall provide appropriate design certifications by the responsible AOR(s) or EOR(s).

1.8.4. Design Exceptions and Waivers

A. Through a formal evaluation process defined in Article 12.4 (Deviations) of the Agreement, the City will consider any reasonable request for design exception or design waiver meeting the criteria of being a minor change to the Technical Requirements, and shall, in accordance with the stated process, either grant or reject the Deviation.

B. Principal Project Company shall be solely responsible for obtaining approvals from the City, Utility Owners, Third Parties, and AHJs for Deviations, as may be required.

C. Principal Project Company shall obtain any necessary Deviation approval before submission of any final Design Documents for a particular design package that incorporates such related design exception or waiver, and shall include such Deviation approval in its submission to the City.

1.8.5. Proprietary Design Reviews

A. Principal Project Company shall prepare and submit Design Documents to the City, in its proprietary capacity as owner, for review and comment according to the process described below in this Section 1.8.5 ("Design Deliverables") and required by Exhibit 11 (Submittal Review Process). These Design Deliverables are independent of any submittals required by any AHJ, Third Party and Utility Owner.

B. The Design Deliverables shall be developed to ensure that the Project is designed and presented at each stage of design as an architecturally- and functionally-integrated development, including Design Documents that indicate how Principal Project Company can achieve the Joint Development Alternatives, Division 3 (Design Criteria Document) and Appendix G of Division 3 (Design Criteria Paratransit), Division 4 (Supplemental Design Criteria), and Division 5 (Battery-Electric Bus Supplemental Criteria).

C. Principal Project Company shall include adequate time for City review of the Design Deliverables at each stage of design, which shall be no less than [14] days, in its submittal schedule and Project Schedule.

1.8.5.1. Proprietary Design Review Process

A. Principal Project Company shall propose a process to produce and present Design Deliverables and facilitate the documentation and resolution of City review comments, provided such process is consistent with this Agreement and Exhibit 11 (Submittals Review Process). Principal Project Company shall submit the proposed process to the City for review and approval before NTP 1. Principal Project Company is solely responsible for implementation of the approved process. Principal Project Company can proceed with advancing Design Documents when a resubmittal is not required under Exhibit 11 (Submittals Review Process) however, Principal Project Company does so at their own risk.

B. Principal Project Company's process shall include the following as a minimum:

1. Develop and provide deliverables to the City at stages specified below in Section 1.8.5.2 or as mutually agreed.
2. Schedule, conduct and document design review meetings at each stage to present design progress and status of Design Deliverables. Minutes from these meetings shall be distributed within a week of occurrence.

C. Develop and implement a process to capture, track status and confirm resolution or other action regarding City comments. Principal Project Company shall, unless otherwise mutually agreed by Principal Project Company and City, provide progressively developed and detailed Design Deliverables to the City at each of the following stages of design:

1. 50% Design Development (50% DD)
2. 100% Design Development (100% DD)
3. 50% Construction Documents (50% CD)
4. 90% Construction Documents (90% CD)

1.8.5.2. Design Deliverables Content

A. Design Deliverables submitted at each stage of design shall, at a minimum, must meet the requirements set forth below.

1.8.5.2.1. 50% and 100% Design Development (50% DD / 100% DD)

A. In this phase Design Deliverables will include, at a minimum, a site plan, elevations and sections, together with a written project brief detailing area calculations, building systems, and specifications, to fully describe the size and character of the entire Infrastructure Facility, including the architectural, building enclosure, roofing, waterproofing, site work,

landscaping, civil, structural, mechanical, process mechanical, electrical, and electrical trolley systems, IT/AV requirements materials and other elements. The 50% DD Design Deliverables will be an '*in progress*' set of Design Documents and the 100% DD Design Deliverables shall include Design Documents that generally adhere to the AIA Design Development Quality Management Checklist.

B. At a minimum the following items will be addressed for the Infrastructure Facility:

1. 1:100 scale drawings incorporating comments from the Schematic Design Phase and illustrating the design development of each of the following areas:
    a. architectural;
    b. site plan including site layout, grading, and utilities;
    c. structural;
    d. mechanical and plumbing;
    e. electrical;
    f. municipal infrastructure and storm water retention; and
    g. landscaping;
2. 1:50 plans showing all dimensions: interior elevations and reflected ceiling plans, including main component drawings that relate to the bus maintenance equipment, and IT.
3. developed exterior elevations of the buildings and major cross-sections;
4. integration of exterior spaces, vehicle access/egress (including drop-off and pick-up access to parking, etc.);
5. a full lighting layout for each floor;
6. efficient integration of major equipment for optimal operations;
7. review of door controls and hardware concepts/strategies;
8. review of security strategies;
9. interior finish concepts (flooring, walls and ceiling finishes) for all spaces and key elevations including a review of standard millwork types and details;
10. development of the circulation routes and way-finding strategy including:
    a. verification of the impact of the layout of the premises on the flow of personnel and material both internal and external to the Infrastructure Facility;
    b. review of way-finding strategies from the Proposal stage and demonstration of how they are incorporated with details in the current design;
    c. room numbering plan for City use (public and staff way-finding); and
    d. signage, orientation, etc.; and
    e. provide preliminary electrical load redundancy and spare capacity calculations for all branches of power identifying loads of different types, such as individual mechanical equipment, lighting, general receptacles, equipment, communications and security equipment and elevators.

1.8.5.2.2. Construction Documents (50% CD & 90% CD)

A. During these stages the Design Documents shall describe in detail the requirements for the construction of all components, systems and equipment of the Infrastructure Facility. The Design Deliverables for 50% CD and 90% CD stages of design shall include all the requirements in this Section 1.8.5.2.2:

1. at 50% completion;
2. at 90% completion,
3. and, despite any later dates set out in the Project Schedule, in a timely way in advance of construction with sufficient detail to allow the City to understand and assess the design of the Infrastructure Facility.

B. If Principal Project Company intends to proceed with construction of an element of the Infrastructure Facility in advance of the completion of the design of the entire Infrastructure Facility then Principal Project Company will deliver the Design Deliverables for 50% CD and 90% CD for that element, coordinated with all disciplines with sufficient accompanying detail to allow the City to understand and assess the design of that element, in advance of the Design Deliverables for other elements of the Facility.

C. Regardless of how Principal Project Company packages or otherwise chooses to advance construction documents for certain elements of the Infrastructure Facility, Principal Project Company shall provide to the City, at a level of detail and documentation that the City would customarily receive or expect to receive for a facility similar to the Infrastructure Facility at 50% CD and 90% CD stages in accordance with Good Industry Practice, Design Deliverables addressing all requirements in Section 1.8.5.2.1 developed to the associated CD stage, as well as:

1. dimensioned floor plans and elevations showing all millwork, furniture and equipment as well as a roof plan showing layout, materials, and details;
2. interior elevations for all rooms and spaces, including all interior finishes, millwork, mechanical and electrical;
3. exterior elevations including openings, closure details, materials and finishes, and color boards;
4. completed site and landscaping plans;
5. room finish schedules including material finishes and color boards;
6. door hardware schedules;
7. reflected ceiling plans coordinating architectural, lighting, electrical, low-voltage, and mechanical features;
8. interior finishes;
9. Room Data Sheets;
10. a written report detailing and describing the manner in which the following have been taken into account in the Design:
    a. validation and confirmation of meeting the program requirements
    b. program operations and delivery;

c. LEED Gold certification, including energy efficiency/sustainability and the relevant LEED project checklist and points;
d. material selection;
e. constructability;
f. life cycle and renewal requirements;
g. any risk assessments;
h. building operating services; and
i. clearly identifying sections for:
    1) architectural design;
    2) site development and landscaping;
    3) structural design;
    4) mechanical design;
    5) electrical design; and
    6) sustainable design.

D. Principal Project Company will only issue drawings and specifications for construction purposes based on Design Deliverables previously reviewed by the City in accordance with this Section 1.8.5.

E. This Section does not limit Principal Project Company's obligation to comply with any requirements set out in the Agreement in relation to the stages and requirements for Design Work.

1.8.5.2.3. Basis of Design Report

A. Principal Project Company shall prepare, submit to the City, and maintain a comprehensive Basis of Design Report (BODR) for the Project that is submitted with the Design Deliverables at each stage of design. The BODR shall demonstrate how the design conforms to the Agreement, including how Principal Project Company can achieve the Joint Development Alternatives required in these Technical Requirements. The BODR shall provide an update on development and status of Allowances in the design of the Infrastructure Facility defined over the course of design development and construction.

B. The BODR shall contain descriptions or otherwise reference the design criteria in these Technical Requirements, see Divisions 2 through 5, outlining Principal Project Company's interpretation of, and compliance with, the Project requirements with respect to configuration, performance, functionality, sustainability, operational, and maintainability requirements for the Project.

C. The BODR shall be logically organized, including at a minimum:

1. Table of Contents.
2. Executive Summary.
3. Design Work.
4. Allowances.
5. Provisions (including provisions for Joint Development).

D. The BODR shall address the following at a minimum:

1. Project-wide design methodology and approach.
2. Applicable design criteria, considerations, influences, and factors. This shall include the LEED scorecard, GS6 form, and energy model for the Project.
3. System selections and element designs.
4. Third Party integration, where applicable.
5. Development and status of Allowances for the Infrastructure Facility including:
    a. Furniture, fixtures and equipment for the Project's office/admin and training spaces
    b. Information technology/communications equipment for the Project
6. Demonstration by all disciplines that adequate provisions are included in the Infrastructure Facility design in order to support the delivery of either Joint Development Alternative. At a minimum, the BODR this shall include the following elements for each Joint Development Alternative:
    a. Architectural layouts for the Joint Development Alternatives requiring minimal if any alterations, such as the addition of vehicular ramps and modifications to roofing materials, including waterproofing systems.
    b. Strength and stiffness of the structure support any additional or modified loads and layouts for the Joint Development Alternatives, such as temporary construction loads, permanent additional loads and masses, the addition of vehicular ramps, and vibrations from vehicles on the roof.
    c. Demonstration of compliance with the design criteria for airborne noise, vibration and structure borne noise.
    d. Utilities and utility rooms, shafts, and other infrastructure are sized to support the Joint Development Alternatives and located to minimize disruption from the Joint Development Alternatives.
    e. HVAC, electrical, low voltage and plumbing equipment, and routes through the Project, are located to minimize disruption from the Joint Development Alternatives, including consideration of maintenance requirements.
    f. Rainwater and storm drain system is designed and located to minimize disruption from the Joint Development Alternatives.
    g. Exiting and circulation layouts, including vertical transportation, require minimal if any alterations from the Joint Development Alternatives.
    h. Building use re-classification is not required.
    i. Logistics and traffic changes to support the Joint Development Alternatives are acceptable, such as additional bus movements.
    j. Demonstration of minimal disruptions to operations, if any, from the Joint Development Alternatives. See Division 4, Section 2.8 (Consideration of Joint Development Alternative Scenarios) for additional specific requirements.

1.8.5.2.4. Provision Documents for Joint Development Alternatives

A. With each proprietary Design Deliverable, Principal Project Company shall advance Design Documents and coordinate all disciplines for the entire Project to demonstrate that adequate provisions are included in the Infrastructure Facility design in order to support the Joint Development Alternatives required in these Technical Requirements ("Provision Documents"). At a minimum, every proprietary Design Deliverable must be designed and

coordinated with the BODR drawings and materials for each Joint Development Alternative to ensure that each Joint Development Alternative can be implemented in the future, by providing the following materials at a minimum as part of the Provision Documents:

1. Architectural layout plans, sections and elevations for areas and levels affected, including access and exiting.
2. Structural, mechanical, electrical and plumbing plans, sections and elevations to accommodate architectural layout plans for areas and levels affected.

B. Provision Documents shall communicate, with images and narrative, potential modifications and modification process required of the Infrastructure Facility to accommodate the Joint Development Alternatives.

C. For an avoidance of doubt, drawings at each stage of the Proprietary Design Review process indicated in Section 1.8.5.2 shall be verified and updated throughout design to explicitly demonstrate that each Joint Development Alternative can be delivered.

D. Changes to the Release for Construction Documents, see Section 1.8.5.3, during construction are subject to the requirements in Section 1.8.5.2.4. A and B.

1.8.5.3. Design Changes

A. Revisions to the Design Deliverables are expected during and as a result of the Proprietary Design Review process and shall not be considered City Changes.

B. Principal Project Company is responsible for implementing and managing a comment and resolution log to track City comments. This log shall be used in design meetings and Monthly Progress Meetings to ensure Principal Project Company and City are clear on design progress.

C. City review and comment on Design Deliverables will primarily focus on compliance with the Technical Requirements but may also include minor refinements or clarifications that do not constitute a material change to the Technical Requirements. City review and comment on Design Deliverables will not constitute regulatory review.

D. In the case where, as a result of a City comment, a revision is required that Principal Project Company believes qualifies as a City Change per Article 12 of the Agreement, Principal Project Company shall raise the concern with the City and the parties shall, acting reasonably, determine if a City Change is required. Principal Project Company shall be responsible for any Change Proposal per Exhibit 9 (Change Procedures) unless the City determines, in its sole discretion, that a City Change Order is appropriate.

1.8.5.4. City Approval of Allowance-related Scope

A. City shall approve the final design of Allowance-related scope prior to any applicable order or purchase made by Principal Project Company or City.

1.8.6. Release for Construction Documents

A. Principal Project Company shall use Release for Construction Documents (RFCDs) to construct the Project. RFCDs shall include, as applicable, plan sheets, specifications, shop drawings, working drawings, and other pertinent information. Principal Project Company shall only use a particular RFCD for construction after all previous comments related to the design elements, whether or not contained or depicted in the subject Submittal, have been correctly resolved and closed, and having obtained appropriate AHJ approvals and permits.

B. Prior to delivering any RFCD, either to the City or to any of Principal Project Company's Contractors, the contents of the RFCD shall be individually signed and sealed by the responsible licensed design professional under the laws of the State of California for the specific content included in the documents. The certifying AOR(s) or EOR(s) shall affix their signature and seal upon the title sheet, that is, on the first cover sheet, and every sheet in a set of several plan sheets per design discipline, on the title sheet and first page of calculations or written reports, and the first page of every separate specification section.

C. Principal Project Company shall not commence Construction Work prior to approval from the appropriate AHJ's.

D. Principal Project Company shall diligently track subsequent design changes and, consequently, drawing revisions by keeping a detailed log and maintaining record copies of Current Status Documents defined in Section 1.6 (Record Documents), which reproduced copies and log shall be available to the City at all times. Changes to the RFCDs are subject to the conditions described in Section 1.8.5.2.4. A and B.

1.9. SUSTAINABILITY

1.9.1. Sustainability Management Plan

A. Principal Project Company shall prepare and submit to the City a Sustainability Management Plan that details approaches it will implement throughout the Term to ensure achievement of the sustainability requirements of the Contract Documents. Annual plan updates during the IFM Period shall document sustainability achievements.

B. The Project, and all facilities therein, shall comply with the current San Francisco Environmental Code, including but not limited to Chapter 7, Green Building Requirements for City Buildings, and including LEED Gold certification.

1.9.2. Sustainability through Integrated Design Process

A. Principal Project Company shall follow an integrated design process, incorporating industry leading conservation practices for energy, water and materials, to optimize design decisions relative to sustainability.

B. Principal Project Company shall engage the major design disciplines, including planning, architecture, structural engineering, landscape design, mechanical, electrical, plumbing, and fire protection as well as other applicable specializations to collaborate on accomplishing sustainability measures.

1.10. BUILDING INFORMATION MODELING

A. Principal Project Company shall utilize building information modeling (BIM) techniques and successor integrated facilities management systems/software throughout the D&C and IFM Periods of the Project. Principal Project Company shall maximize object intelligence and ensure easy integration with other components of the facilities with which the Project will interface or those facilities adjacent to the Project.

1.10.1. BIM Roles and Responsibilities

1.10.1.1. The City Coordination

A. Principal Project Company's BIM Models shall be in accordance with the BIM Project Execution Plan (PxP), as defined in Section 1.10.2 (BIM Project Execution Plan). All models must be compatible with the version of Revit-based applications in use by the City at the Setting Date.

B. Principal Project Company shall collaborate with the City in developing and incorporating into future iterations of the BIM PxP more highly detailed model requirements and drafting standards as part of modeling efforts.

C. Principal Project Company shall provide, for quality assurance purposes, access by the City to the Project's model database storage.

1.10.1.2. Principal Project Company BIM Responsibilities

A. Principal Project Company shall assume the following BIM roles and responsibilities:

1. Develop Project's BIM PxP describing the BIM implementation approach to be followed by Principal Project Company's BIM team during all Project phases;
2. Produce 3-dimensional (3D) design models of the major Project elements to an appropriate Level of Development (LOD) and as defined in the approved BIM PxP;
3. Combine 3D design model elements into an integrated model for construction planning and facilities management purposes;
4. Perform BIM activities as defined in the approved BIM PxP;
5. Generate properly formatted 2-dimensional plan sheets (drawings) from the finalized 3D design model;
6. Use 3D model to generate a construction sequence planning model (3D/4D model) for further evaluation and optimization of design;
7. Deliver an integrated design model to the City with each Design Deliverable, with successive Design Deliverable submittal exhibiting further refinement of key details; and
8. Update 3D model as construction progresses and provide LOD 500 As-Built Model at Final Acceptance.

1.10.1.3. BIM Manager

A. Principal Project Company shall appoint a full-time, project-dedicated BIM Manager to manage and oversee the implementation of the program- and/or Project-level BIM program. The BIM Manager serves as the Project Teams' point-of-contact on matters including, but not limited to, compliance with BIM PxP, data exchange, shared coordinates, and multidisciplinary design coordination. The BIM Manager's role and responsibilities include:

1. Ensuring that models are geospatially located and are consistent with the City's geospatial coordinate system;
2. Ensuring that all Design team members are delivering and updating their respective information models according to the currently accepted Project Schedule version;
3. Ensuring that submitted building information models comply with all requirements as defined in the applicable controlling documents;
4. Reviewing integrated design model for trade coordination purposes and perform clash detection;
5. Providing design coordination and constructability feedback to all disciplines regarding their uploaded information;
6. Facilitating design and trade coordination meetings; and
7. Serving as point-of-contact for BIM coordination with the City .

1.10.2. BIM Project Execution Plan

A. The BIM Execution Plan shall describe the Principal Project Company's BIM-enabled workflows and systems to successfully deliver, operate, and maintain the Project, principally as a Level-2 BIM and in accordance with the BIM objectives and other parameters to be established in the Owner's Information Requirements (OIR).

B. Principal Project Company shall prepare and submit to the City a BIM Project Execution Plan (BIM PxP) pursuant to the template included in the Reference Documents and shall include master information and data management, and assignment of individual roles and responsibilities for well-coordinated model generation and data integration. The BIM Execution Plan shall set forth the processes and requirements for progressive development of an integrated BIM 3D-4D (schedule)-5D (cost)-6D (asset management) model for the Project.

C. At a minimum, the BIM Execution Plan shall describe:

1. BIM objectives and uses;
2. Roles and responsibilities of the Parties;
3. BIM requirements and processes;
4. Methods and protocols / standards;
5. Schedule for progressive development of the BIM model according to the Project's anticipated development;
6. Supporting software requirements; and
7. Development of (a) as-built drawings from the BIM model and (b) the as-built BIM model.

D. The BIM Execution Plan shall be consistent with and reference, as applicable, the relevant design review, project management, and or quality management processes and requirements set forth in this Division 1.

E. The BIM Execution Plan shall include a section that describes how the Principal Project Company will work with the City to develop the OIR, including workshops and a BIM strategy for the Project. At a minimum, the OIR shall include:

1. **BIM objectives**: the BIM objectives for the Project, which shall align with this Section 1.10 and the DMP;
2. **BIM uses**: the application of BIM methodologies and tools the Principal Project Company and City will use to achieve the BIM objectives;
3. **Level of detail**: the types of information and level of detail used to specify the datasets that the model entities shall contain, and the depth of such information. The level of detail refers to the depth of geometric and non-geometric information for each dataset ("**level of detail**");
4. **BIM deliverables**: any document or information developed by the Principal Project Company that is necessary for the creation of the BIM models and the products resulting from the implementation of BIM tools and processes—at a minimum, these BIM deliverables shall include the BIM Execution Plan (BIM PxP), the BIM models, and other supporting documents;
5. **Collaboration strategy**: the strategy for the City and Principal Project Company to collaborate within the BIM environment, which shall incorporate known methods for management and information exchanges throughout the lifecycle Project. At a minimum, the collaboration strategy shall describe how the City and the Principal Project Company will access, review, and approve information throughout the lifecycle of the Project; the collaboration strategy shall address the common data environment(s) ("**CDE(s)**") that the Principal Project Company will deploy to achieve the BIM objectives and the collaboration strategy;
6. **Model structure / organization to share structured, unambiguous information as part of the BIM environment:** the strategy for the City and the Principal Project Company to agree on the minimum standardization requirements to guarantee the availability and quality of information throughout the lifecycle of the Project—examples of requirements for which Principal Project Company must obtain City's mutual agreement upfront (before developing the BIM) include the BIM units, naming, and model sizes; and
7. **Integration with Asset Management**: the City and Principal Project Company shall agree on the asset data management for the Project's Asset Management Plan, which shall be developed in accordance and coordination with the SFMTA's current asset structure and hierarchy in accordance with SFMTA's Infor CloudSuite EAM platform

1.10.3. BIM Data Specifications

A. Principal Project Company shall utilize the ASTM UNIFORMAT II Classification System and the OmniClass Construction Classification System (OCCS), or equivalent.

1.10.4. Model Ownership

A. Principal Project Company shall turn over to the City the finalized BIM model for each SFMTA O&M Facility within 30 Days after the City's Final Acceptance of the SFMTA O&M Facility.

1.11. CONSTRUCTION MANAGEMENT

1.11.1. Construction Safety

A. Principal Project Company shall be solely and fully responsible for the health and safety of persons during the performance of the Work as specified in Division 10 of the Technical Requirements.

1.11.2. Construction Security

1.11.2.1. Overview

A. Principal Project Company shall secure the Project Site and maintain it in a secure manner at all times. Security of the Project Site, equipment, construction materials and all other items contained on the Project Site shall be Principal Project Company's sole responsibility at all times. Principal Project Company shall be solely responsible for all damage and the restoration of damaged property resulting from illegal trespass or unauthorized entry.

1.11.2.2. Project Site Security Plan

A. Principal Project Company shall develop, submit to the City, and maintain a Project-specific Site Security Plan (SSP). The document shall define the oversight management program, team organization, and operating strategy to provide and maintain work site security. The SSP shall define the personnel responsible for developing and implementing enhanced security work practices. The SSP requirements shall be strictly enforced by Principal Project Company's field-based security personnel.

1.11.2.2.1. SSP Content

A. The SSP shall be organized into indexed sections containing, at minimum, the following information:

1. Table of contents.
2. Intent and purpose policy statement with approving official's name and signature.
3. Sensitive security information.
4. Project security organization chart.
5. References.
6. Emergency action plan and personnel contact information.
7. Security risk analysis of Project Site, including crime data for proximity areas of Project Site.
8. Work zone/site diagram of construction site boundaries.
9. Project Site working hours.
10. Project Site access control.
11. Procedures for controlling delivery vehicles.
12. Physical security, where provided, including at a minimum:
    a. Perimeter, including fencing and lighting.
    b. Project site signage, including language to deter trespassers. and

c. On-site and boundary lighting.

13. Equipment security (inventory, controls).
14. Incident reporting.
15. Evacuation plan, route, and rally points.
16. Police department protocols.
17. Explosives handling, storage and transport policy.
18. Trash / recycling removal.
19. Trailers and temporary buildings.
20. Storage containers.
21. Motorized equipment security, including fuel tanks, fuel storage, and batteries.
22. Surveillance, where provided, to include video surveillance and security guard service.
23. Security awareness training.
24. Security progress reporting.
25. Project site audits, reporting and follow-up. and
26. Graffiti and vandalism control.

B. The SSP shall be applicable to all personnel, visitors, guests, delivery personnel, and Contractors engaged by Principal Project Company on the Project.

C. The SSP shall comply with applicable Federal, State and local laws, regulations, codes and requirements.

1.11.2.3. Security Requirements

A. Principal Project Company shall manage and maintain the secure perimeter of the construction site inclusive of temporary office facilities pursuant to the approved SSP.

B. Principal Project Company shall prepare and update a Personnel Site Access Roster annotated with time/location and/or particular personnel restrictions. The Personnel Site Access Roster shall be updated when changes in personnel having restricted site access occur. Principal Project Company shall submit the Personnel Site Access Roster within 24 hours after receiving a written request from the City.

C. The City personnel generally shall, at all times but subject to Project-specific safety and security requirements, have unrestricted access to the Project construction site, to be exercised at the City's discretion.

1.11.2.4. Coordination Requirements

A. Principal Project Company shall coordinate Emergency services protocols and procedures, and provide accurate and current personnel contact information sheets. Principal Project Company shall provide and maintain similar information with respect to all appropriate agencies and Utility Owners to ensure:

1. Provisions for documented procedures in response to emergencies, incident reports, and assistance calls.

2. Appropriate patrol of environment external to the Project Site, including storage and laydown yards. and
3. Provision of criminal investigative support.

B. In the event of a security incident, Principal Project Company shall contact Emergency services for immediate response and then promptly inform the City, followed by appropriately describing and documenting the incident in a written report.

1.11.2.5. Security Identification

A. Principal Project Company's security personnel shall at all times when on duty, carry and clearly display a visible photo ID badge identifying them as such.

B. Principal Project Company's field-based personnel shall be obligated to report immediately any suspicious activity and unknown or unidentified individual(s) to the designated Site Security Supervisor when observed within or around the context of secured construction worksite perimeter.

1.11.3. Maintenance of Traffic and Work Restrictions

A. Principal Project Company shall organize its construction activities to ensure that the surrounding community function with minimal disruption or inconvenience to the public, whether pedestrians or motorists. Close coordination with the City and other Stakeholders shall be provided at all times.

B. Principal Project Company shall implement controls to ensure transportation principles and standards governing the design, application, and maintenance of the various types of traffic control measures and associated devices required for street construction and maintenance of traffic work are utilized. These principles and standards shall promote safe and expeditious movement of the public through construction and maintenance zones, to ensure the safety of workers performing these activities. Minimum standards of application shall include controlling traffic moving through Work areas, including traffic devices, markings, barricades, channelizing, and hand-signaling devices.

C. Construction within any public right-of-way shall conform to the safety standards and operating guidelines promulgated by the "Regulations for Working in San Francisco Streets (Blue Book)" by SFMTA, latest edition.

D. No area within the public right-of-way (from property line to property line and including streets, parking strips, bicycle lanes, gutters, curbs, paths and sidewalks) shall have restricted public access for more than five (5) Days, with the exceptions of areas of new curb ramp and bus pad construction. Principal Project Company shall restore and reopen to the public any and all areas of the public right-of-way within these specified time limits.

E. Principal Project Company shall coordinate the Work such that it does not prevent pedestrians from entering operating businesses.

F. Principal Project Company shall coordinate the Work such that any time that the Work occupies the sidewalk along any block, the Principal Project Company shall coordinate with the businesses that are located on or require access through occupied area to maintain daily delivery access and access to garbage/recycling removal services. If the Principal Project Company's activities prevent a business from placing its garbage or recycling on the

curb for pickup, Principal Project Company shall at its expense assist the business with handling and transport of garbage and recycling refuse to nearby designated garbage/recycling collection locations.

G. See Division 10, Section 01 35 50 (Additional Environmental Procedures), Sections 2.5 and 2.6, for additional instructions and requirements related to minimizing disruptions of pedestrians, bicyclists, transit vehicles, and emergency vehicles.

1.11.3.1. Transportation Management Plan

A. Prior to construction, Principal Project Company shall prepare and submit to the City a Transportation Management Plan (TMP) describing how safe traffic operations will be managed and maintained during each phase of construction and in every work zone of the Project.

B. All traffic control measures shall be sufficient to maintain traffic and pedestrian circulation on streets affected by construction of the Project. The measures will also, at a minimum, be consistent with the requirements of the San Francisco Municipal Transportation Agency (SFMTA)'s Blue Book. Traffic control measures may include but not be limited to, flaggers and/or construction warning signage of work ahead; scheduling truck trips during non-peak hours to the extent feasible; maintaining access to driveways, private roads, and off-street commercial loading facilities by using steel trench plates or other such method; and coordination with local emergency responders to maintain emergency access. Any temporary rerouting of transit vehicles or relocation of transit facilities shall be coordinated with SFTMA Muni Operations.

C. At a minimum, the TMP shall address traffic management requirements in Division 10 of these Technical Requirements and include the following items:

1. Processes to produce Maintenance of Traffic (MOT) plans, including development, dissemination, implementation, monitoring, refinement, and maintenance of MOT plans.
2. Names, roles and responsibilities, and qualifying experience and credentials of key personnel, with traffic control expertise, who plan, design, direct, implement, and maintain the TMP.
3. Procedures to design, plan, schedule, and coordinate construction activities to reduce disruptions to vehicular and pedestrian movements in the vicinity of the Project. The TMP shall especially consider existing vehicular and pedestrian movements prior to construction and take appropriate steps to minimize the disruption of these movements during construction.
4. Procedures to coordinate with Emergency services, including local enforcement agencies and first responders for the City of San Francisco Police and Fire Departments as appropriate, including preparation of an Emergency Services Plan outlining how Emergency services access will be maintained at all times and conditions regularly communicated to the proper authorities.
5. Procedures to identify and incorporate the needs of various Utility Owners, governmental entities, local officials, business owners, and other Third Parties in the Project areas.

6. Procedures for obtaining acceptance of detours, road and lane closures and other traffic pattern modifications from SFMTA, and implementing and maintaining those modifications.
7. Procedures for maintenance and replacement of traffic control devices, including pavement markings and traffic barriers.
8. Procedures to regularly evaluate and modify, if necessary, traffic signal timings, and the procedures for the development, approval, implementation, testing, and maintenance of all affected signals.
9. Procedures to coordinate with SFMTA routes to provide temporary system compatibility, establish responsibilities for temporary signal installation, maintenance, operation and removal, and coordinate traffic signal timing with local signal networks.
10. Procedures and process for the establishment of haul routes and the safe ingress and egress of construction vehicles in the designated work zones, including a full description of the haul route to and from any staging area to construction and/or disposal sites.
11. Procedures to modify plans as needed to adapt to current Project circumstances including a contingency plan to alleviate unreasonable construction-related back-ups that can be implemented immediately upon notification from the City.
12. Procedures to communicate TMP information to Project public information personnel and notify the public of reportable MOT issues.
13. Descriptions of contact methods, personnel available, and response times for any deficiencies or critical conditions requiring special attention during off-work hours.
14. Procedures for coordinating with affected neighboring property owners and all businesses directly adjacent to the construction work-zones to address mitigating impacts to access. and
15. Traffic analysis of current traffic conditions and projected traffic conditions for each construction phase or Work activity that affects traffic around the Project site. The traffic analysis shall evaluate level of service, calculate trip delays, and analyze sight distances.

1.11.3.2. MOT Design Requirements

1.11.3.2.1. Traffic Control Plan

A. Principal Project Company shall follow procedures set out in the TMP and the SFMTA Blue Book, latest edition, to develop and submit to the City detailed Traffic Control Plans (TCPs) , which provide for all construction phases, as well as all required traffic switching procedures. Principal Project Company is solely responsible for the installation, maintenance, and removal of all elements of the TCPs.

B. Principal Project Company shall produce a TCP for each phase of Work that affects traffic and involves traffic control details, and shall coordinate with the City on developing the TCP. Principal Project Company is responsible for obtaining all necessary permits from AHJs to implement the plans.

C. The TCP shall include details for all detours, traffic control devices, striping, and signage applicable to each phase of construction. Information included in the TCPs shall be of sufficient detail to allow verification of design criteria and safety requirements including typical sections, alignment, striping layout, and pavement drop off conditions. TCPs shall clearly designate all temporary reductions in speed limits. Changes to posted speed limits will not be allowed unless specific prior approval is granted by SFMTA in its regulatory capacity.

   1. Principal Project Company shall maintain signing continuity on all active roadways within or intersecting the Project at all times.

D. Throughout the D&C Period, Principal Project Company shall keep all streets and intersections open to traffic by constructing work in systematic stages or segments. Principal Project Company shall maintain access to all streets adjacent to construction activity and shall provide for ingress and egress to public and private properties at all times. Principal Project Company shall assist in preparing and broadcasting public information notices, in accordance with Section 1.15. (Communications and Public Information), well in advance of the implementation of lane closures or traffic detours.

1.11.3.3. Control of Pedestrian Activities

A. Principal Project Company is required to provide safe passage of pedestrians in a manner that provides for safety and convenience to the public. Pedestrian and circulation plans describing any restrictions, closures and alternative routings to those properties adjacent to the Work area shall be included in the TCP's for all construction activities that affect pedestrian movements.

B. Pedestrian and circulation plans shall comply with the following standards:

   1. All access to and egress from public facilities must be serviced with pedestrian accommodations.

   2. Provisions of appropriate walkways, crosswalks, signage and signalization, pushbutton "Walk/Don't Walk" signals, and other devices are required during all stages of construction. (Principal Project Company may be required to relocate said facilities or to cover facilities and provide temporary facilities of a similar type and magnitude.)

   3. Where pedestrian activities are located parallel to and in the vicinity of any vehicular roadway or travel path without a curb section, continuous concrete barrier protection and its related crash attenuators must be provided. Concrete barrier or construction fencing shall be continuously used to segregate pedestrians from construction areas.

   4. Pedestrian detour routes must comply with accessibility law.

1.11.3.4. Construction Requirements

A. Principal Project Company shall maintain safe traffic operations and control at all times. Principal Project Company shall keep a copy of the approved permit, digital or hard copy, readily available on-site. If at any time the City or other jurisdictional agency's public safety officer determines that the traffic control is not safe to the public or does not meet the intent of the TMP or any specific traffic control plan, Principal Project Company shall take immediate steps to correct the situation as directed. Principal Project Company's

construction operations shall maintain access for the City personnel, and Emergency Services vehicles to areas requiring access at all times.

B. At the end of each work-shift during which lane(s) have been closed, components of the traffic control system (except portable delineators placed along open trenches or excavations adjacent to the traveled way) shall be removed from the traveled way. Traffic signs and signal equipment must be removed or covered when not in use.

   1. All traffic control devices shall be kept in their proper position at all times and shall be repaired, replaced or cleaned as necessary to preserve their appearance and continuity as manufactured.

C. Principal Project Company shall provide portable changeable message signs, flashing arrow boards, and cones/barricades as field conditions warrant and as deemed necessary by SFMTA, in its regulatory capacity, even if they are not shown on the traffic control plans.

D. All temporary traffic control devices shall be removed following completion of each construction stage and the normal operation of permanent traffic control devices shall be restored and/or provided by Principal Project Company.

E. Any damage to traffic signal detector loops, conduits, interconnect, or fiber optic cable shall be immediately reported to the City or its authorized representative, and repaired immediately by Principal Project Company at Principal Project Company's sole expense. Principal Project Company shall take immediate, necessary steps to rectify the situation, including providing a flag person, temporary stop signs, or other devices as the City may direct.

F. Haul Routes shall be submitted to and are subject to approval by SFMTA and other AHJs as required. Submittals shall comply with the requirements of Division 10 (SFPW General Requirements for Construction). Construction deliveries requiring lane closures shall receive prior approval from SFMTA. Notifications of deliveries shall be made with sufficient time to allow for sufficient review and incorporation of SFMTA comments.

1.11.3.4.1. Detours

A. Principal Project Company shall provide motorists with guidance on diverting around the construction, detouring around specific construction sites, and traveling through the construction areas. This shall include the installation and maintenance of temporary regional signs to divert traffic to alternate routes, as appropriate. Motorist guidance to and along detour routes shall be provided, together with regional guidance.

1.11.3.4.2. Temporary Maintenance of Pavement

A. Temporary pavement shall be engineered to handle traffic loads while the detour is in place without cracking, rutting, raveling, spalling, bleeding, reduction in the coefficient of friction, or faulting that may affect the safety and comfort of the travelling public. Any pavement defects that may compromise the safety of the traveling public shall be corrected immediately.

B. Temporary pavement placed for detour purposes shall be removed prior to Final Acceptance. Existing pavements used as detour or haul roads shall be restored to their original condition.

1.11.3.4.3. Pavement Markings

A. Principal Project Company shall completely remove existing pavement markings that conflict with temporary or permanent pavement markings. These pavement markings shall be removed by any method that does not materially damage the surface or texture of the pavement. Pavement marking removal by over-painting is prohibited.

1.11.3.4.4. Reinstatement of Utility Cuts

A. After installation of drainage structures, storm sewers, or any other public or private utility facility by open cut beneath existing pavements carrying traffic during construction, the pavement shall be restored by Principal Project Company to the satisfaction of SFMTA to provide a normal satisfactory riding surface.

1.11.3.4.5. Hauling Equipment

A. Principal Project Company shall keep traveled surfaces used in its hauling operations clear and free of dirt or other debris that would hinder the safe operation of roadway traffic. Rubber-tired equipment shall be used for moving dirt or other materials along or across paved surfaces.

B. Where Principal Project Company moves any equipment not licensed for operation on public highways on or across any pavement Principal Project Company shall protect the pavement from all damage caused by such movement. Any damage caused by Principal Project Company's operations shall be repaired at Principal Project Company's sole expense.

1.11.3.4.6. Final Clean-Up

A. Principal Project Company shall clear and remove from the Project Site all surplus and discarded materials and debris of every kind and leave the entire work zone in a smooth and neat condition after completing any construction process.

1.11.3.4.7. Traffic Control Plan Field Redlines

A. In the event that approved traffic control plans require modification during their implementation, due to unexpected field conditions, Principal Project Company shall implement such modifications on a temporary basis.

B. Principal Project Company shall review such modifications with the EOR and generate a design solution for the remainder of the construction stage in the form of a redline Traffic Control Plan, stamped by the EOR and submitted to SFMTA within 72 hours of implementing the temporary field modification.

C. Any related plans, including temporary traffic signal plans and temporary street lighting plans shall be similarly updated and submitted to SFMTA for information.

1.11.4. Temporary Facilities and Utilities

1.11.4.1. Temporary Utilities

A. Principal Project Company shall provide all temporary utility systems, services, connections and disconnections necessary to perform the Work, including maintenance of utility service to adjacent properties and utility service necessary for the City staff to perform Project-related functions.

B. Principal Project Company shall obtain and pay for any required temporary services and associated permits.

C. Principal Project Company shall provide to the City temporary utility designs and engineered drawings as necessary per the specific requirements of the AHJ and respective Utility Owner. Principal Project Company shall coordinate with all parties as necessary to provide temporary utilities, subject to the restrictions of Third Party and Owner Utility agreements.

D. Principal Project Company shall disconnect and remove these temporary utilities connections that become unnecessary as the Work progresses, including restoration of existing improvements disturbed by the temporary utility connection, as applies, to the AHJ's satisfaction.

E. Upon disconnection of temporary systems, Principal Project Company shall restore to original condition all disturbed areas and facilities (street improvements) not otherwise being improved as part of the Project.

1.11.4.2. Project Management Office Requirements

A. Principal Project Company shall establish a local area Project Management Office from which to manage, direct and administer the design and construction of the Project. In addition, Principal Project Company shall establish no less than one other temporary, field office (the Project Construction Management Office) for purposes of housing onsite construction administration and inspection services.

B. The City's personnel will co-locate with Principal Project Company and its Contractors at the on-site construction management office for the duration of the D&C Period. Principal Project Company shall provide temporary facilities for the City's needs in accordance with the Contract Documents.

C. Principal Project Company shall obtain and pay for any required Regulatory Approvals, including temporary facility permits.

1.11.4.3. Construction Management Offices Requirements

A. Principal Project Company shall provide and manage fully outfitted, furnished and sufficiently networked office spaces for accommodating both Principal Project Company's and the City's personnel including, at a minimum, the provision of required insurance, lease agreements, utility connections, utility service, internet service, maintenance, janitorial, security and other services necessary to provide lighting, heating, power, water and sanitation in these required temporary facilities. All office furnishings shall be new when the office is first equipped, and shall be maintained in good working order.

B. Principal Project Company shall provide temporary, offsite parking facilities, sufficient for the number of individuals assigned to this temporary facility plus accommodation for visitor parking.

C. Fixtures, equipment, systems, and appurtenances furnished by Principal Project Company for use by the City shall remain intact and be returned to Principal Project Company as Principal Project Company's property no more than 45 Days after Final Acceptance.

D. Heating and air conditioning of sufficient capacity and zoning shall be provided to adequately control room temperatures at all times. In the event that temperature is not within an acceptable range, regardless of cause, for more than two hours, Principal Project Company shall take necessary measures (including temporary heating or cooling) to restore temperature within two hours to an acceptable range of room temperatures as the City may determine.

E. Principal Project Company shall provide integral sanitary facilities within these temporary offices exclusively for the use of office personnel. Such sanitary facilities shall include a flushing water closet and lavatory with hot and cold potable water. Principal Project Company shall obtain sanitary sewer permit and provide connection to public sanitary sewer if the permitting agency so requires. Each restroom shall be suitably equipped with liquid soap dispensers, toilet paper dispensers, toilet seat cover dispenser, paper towel dispensers, paper waste receptacles, industrial-grade first aid kits with eyewash stations, all furnished with continuous, ongoing supply of associated consumable restroom and janitorial products. Separate restrooms shall be provided for each gender. Principal Project Company shall provide cleaning of the restrooms and employee break room wet counters daily.

F. Principal Project Company shall provide kitchen facilities in these temporary offices, including microwave oven, refrigerators that produce ice cubes, a source of purified cold and hot drinking water, coffee / tea machines, and paper towels, cups and plates.

G. The space for the City shall be furnished and equipped in good and serviceable condition, at least of the same quality as Principal Project Company's counterpart staff space.

H. Principal Project Company shall be responsible for disposal or removal of all the City office facilities and any Project Site restoration following closure of the offices.

I. Principal Project Company shall provide a temporary facility at the Project Site for housing Construction Management Offices, as follows:

    1. Principal Project Company’s space may be as determined by Principal Project Company. Jointly shared space and space for the City’s exclusive use shall include elements defined in **Table 2** (CM Office Space Requirements for the City). The quantity and size of spaces shall be coordinated and determined with the City.

    2. Principal Project Company shall ensure City has continuous access to site and office facility via keys or card keys/fobs.

    3. Separate, secured, storage suitable for the City-provided portable equipment.

    4. Hard-surfaced (paved) parking, sufficient for City Project vehicles and visitor spaces dedicated to the City, quantity to be discussed and established with the City.

    5. At least one conference room large enough to facilitate all-hands meetings with Principal Project Company and the City.

J. Principal Project Company shall provide to the City Construction Management Office site and floor plans prior to planned occupancy.

Table 2: CM OFFICE SPACE REQUIREMENTS FOR THE CITY

Space	Quantity	Minimum Size (SF)
Office (City)	1	200
Workstation Cubicle (City)	2	100 per workstation
Conference Room (Shared)	1	500

K. Principal Project Company shall commence its occupancy and the City shall have ability to commence occupancy of the temporary facilities no later than 14 calendar days from NTP 2, which the City occupancy shall continue without interruption until Substantial Completion

1.11.4.4. Office Systems and Equipment

A. Principal Project Company shall provide the City with continuous access to and shall maintain, at a minimum, trouble-free operation of the following systems and equipment at this temporary office:

1. Electrical infrastructure adequate for office use.
2. High-speed internet connection, hard wired and wireless network. DSL Internet Service, 50 Mbps minimum and wireless router, exclusive to the City's office.
3. Computer network wiring for workstation to support all networked devices.
4. 4-drawer steel file case with lock and key.
5. Plan rack and hangers.
6. 4'x4'x1' deep metal bookcase.
7. Waste paper basket
8. Clothes hangers and rack on wheels.
9. Network connected laser printer, dry copying type using bond paper - scanner and fax capable; able to copy 8½ x 11 and 11 x 17 size paper at 45 page per minute (ppm); features to include color, b&w, auto doc feeder, duplex copying/printing, collate, staple, hole punch and sort options.
10. Computers, monitors and cables.
11. HDTV with wall mounting bracket and white board in each conference room.
12. Consumables such as paper, pads, sticky notes, writing utensils, erasers, rulers, staplers, paper and binder clips etc. as needed and requested by the City.

1.11.5. Construction of Laydown, Staging, and Casting Yard

A. Principal Project Company shall utilize the Project Site and provide any additional support areas required.

1.11.6. Project Site Cleaning

1.11.6.1.1. Waste Material

A. Principal Project Company shall, at all times, maintain the Project Site in a clean and neat condition, clear and free of waste, trash, rubbish and debris. Waste management shall comply with requirements herein as well as those in Division 10 of the Technical Requirements.

B. No construction waste material shall accumulate or remain on the Project Site or adjoining streets and public right-of-way, and any remnants or traces must be removed immediately, without additional cost to the City. Principal Project Company shall clean and continue to keep clean all roadways, sidewalks, and other public areas in which the Work is to be done. Such adjoining areas shall be protected against unauthorized dumping of waste material by others, which is Principal Project Company's sole responsibility to remove, and shall be left in a clean and neat condition.

C. Concrete mixing trucks shall not be washed on local City streets, nor shall the waste material from the washing out of concrete mixing trucks and grouting operations be discharged to any sewer manhole, catch basin, sewer or storm drain. Principal Project Company is solely responsible to prevent waste or debris from entering into storm or sanitary systems.

D. All trash, litter, vegetation material, recycling, and similar waste generated in the course of construction shall be placed into rodent-proof, tightly covered, plastic-lined rubbish containers or trash/recycling receptacles located in each construction work-zone.

E. All construction work-zones shall be protected against unauthorized dumping of waste materials by others, which is Principal Project Company's sole responsibility to remove, and shall be left in a clean and neat condition.

F. Any refuse or debris that spills or blows from a rubbish container or trash receptacle shall be cleaned up immediately.

1.11.6.1.2. Public Roadway Cleaning

A. Principal Project Company shall prevent dirt and debris transfer from the leaving the Project Site and from spilling onto public roadways, sidewalks, paths, and trails adjoining the Project Site. Maintenance of the work area and debris/spill control shall comply with the requirements in Division 10 of the Technical Requirements. Dirt and debris transferred to paved surfaces shall be cleaned up immediately.

B. All public roadways and walkways with adjacency and near adjacency to the Project, including public ways and roadway approaches within the Project Site limits, shall be cleaned daily. All haul routes shall be cleaned daily. Dry sweeping of streets is prohibited.

1.11.7. City Access Period Make-Ready Requirements

A. Principal Project Company shall prepare the IT/Comms Site prior to the City Access Period so that the IT/Comms Site is:

1. Thoroughly cleaned and dust free;
2. All molding and finish work is completed;
3. Final coat of paint is applied and dry; and

4. All power and data cabling is installed and functioning.

B. For the MDF and all IDFs, Principal Project Company shall ensure the following additional conditions are met prior to the City Access Period:

1. Spaces are conditioned with required temperature controls; and
2. Door installed is lockable.

1.12. COORDINATION WITH THIRD PARTIES

1.12.1. Third Party Coordination

A. Except as otherwise prescribed in the Contract Documents, Principal Project Company shall coordinate directly with each Third Party entity to identify, collaborate and resolve all items and issues that impact the Project. Principal Project Company shall invite the City's designated representative to participate in Third Party coordination efforts, which includes responsibility to arrange meetings, obtain permits and approvals from AHJs, and to design, purchase / acquire equipment and materials, construction and inspection. City and/or the Third Party (agency or utility) will be inspecting and/or providing oversight of Principal Project Company's construction and resulting compliance with quality assurance/quality control requirements, accepted implementation plans and testing.

B. Principal Project Company shall coordinate and resolve all Third-Party items and issues throughout the D&C Period of this Agreement, whether or not:

   1. The City has had previous discussion with a Third Party;
   2. The City has executed a separate agreement and/or signed a memorandum of understanding with a Third Party; or
   3. The City has or has not identified a Third Party.

C. Principal Project Company shall engage a Third Party and Utility Coordination Manager (TPUCM) assigned exclusively to the Project to serve as the main point of contact for Third Parties until the end of the D&C Period. Such TPUCM shall have previous relevant experience on at least two design-build projects, with at least one in the San Francisco area within the last five years.

1.12.2. Third Party and Agency Coordination Contacts

A. For relations with Third Parties and Utility Owners not covered by separate agreements, Principal Project Company shall be responsible for all coordination activities, including identifying and maintaining updated contacts lists.

1.13. COORDINATION WITH UTILITY OWNERS

A. Principal Project Company shall coordinate directly with respective Utility Owners to identify and confirm utility locations, potential conflicts and relocations necessary for the Project.

B. Principal Project Company shall take all actions necessary and reasonably practicable to identify and confirm the existence and exact location, size and type of all Utilities within the Project Site or otherwise potentially affected by the Project construction, including all potentially impacted service lines.

C. Principal Project Company is responsible for Utility investigations, conflict resolution, design, design approvals, construction permits, construction, inspection, commissioning and coordination of all new and existing utility line adjustments and protection.

D. Principal Project Company's obligation to coordinate is applicable to all Utilities in any way impacted by the Project, whether or not:

1. The City has had previous discussions with a Utility Owner.
2. The City has entered into a utility agreement with the affected Utility Owner.
3. The City has reliably represented the existing utility on mapping and
4. The utility was installed before, during or after construction and during the Term of this Agreement.

E. Principal Project Company may enter into separate agreements with one or more Utility Owners. Principal Project Company shall submit to the City all such utility agreements before executing.

F. Regarding Utility Coordination and Utility Work, the TPUCM shall be the main point of contact for Utility Owners and the City until the end of the D&C Work, overseeing all Utility Work performed for the mutual benefit of the Principal Project Company and the City.

1.13.1. Utility Coordination Work Plan

A. For each Utility, Principal Project Company shall prepare, submit to the City, and implement a Utility Coordination Work Plan (UCWP), which shall include:

1. Preliminary identification of Utility Work necessary for the Project.
2. Identification of the party responsible for the design, construction, inspection, acceptance, and cost of the specific Utility Work in accordance with the Contract Documents.
3. Verification that all post-construction utility facilities are capable of providing service at least equal to that offered by the pre-construction utility facilities, unless Utility Owner has specified otherwise.
4. Submittal, Review, and Approval processes for the City and Utility Owner, as required, in accordance with the Contract Documents and respective Utility Agreements and Utility Owner standards.

5. Regularly-scheduled utility coordination meetings, beginning 30 Days after concluding the Project Work initiation meeting and continuing until the end of the D&C Period. Meetings shall be attended by designated representatives of Principal Project Company, Utility Owners, affected Stakeholder(s) and the City. Principal Project Company shall record and distribute meeting agendas, minutes, and attendance records.
6. Creation, maintenance and update on a monthly basis the Project Utility Plans showing existing, proposed, and As-Built utility alignments, including temporary relocations and abandonments.
7. Establishing design and construction procedures, processes and schedule for adjusting utilities.
8. Establishing a process and protocols for emergency work that includes timely status updates and coordination with the affected Utility Owner and the City, for issue resolution.
9. Ensuring that Utility Work is completed in accordance with the particular utility coordination work plan. and
10. Creation, maintenance, submittal to the City, and monthly update of a Utility Coordination Work Plan Status Updates, as further defined in Section (Utility Matrix and Utility Work Status Plan).

1.13.2. Utility Project Execution Plan

A. Principal Project Company shall prepare and submit to the City a Utility Project Execution Plan for each Utility Owner and Third Party. City and Principal Project Company, along with relevant Utility Owner or Third Party shall mutually agree upon a Final Project Execution Plan with respect to the particular UCWP. For purposes of this Section 1.13.2, "Utility Coordination Work" includes Principal Project Company's performance of any Betterment for benefit of a Utility Owner and "Principal Project Company's Third Party Work" includes Principal Project Company's performance of any additional improvement for the benefit of a Third Party.

B. Principal Project Company shall submit a sample Project Execution Plan in accordance with a schedule that comports with Principal Project Company's construction schedule. Principal Project Company shall elicit and incorporate Utility Owner's engagement/consultation efforts in the planning, design and construction processes as early as possible. An initial Draft Project Execution Plan shall be submitted no later than 60 Days following NTP 1. The Project Execution Plan shall include division of responsibilities between Utility Owner and Principal Project Company as it pertains to design, procurement / provider of material and equipment, construction, testing and acceptance.

C. Each initial Draft Project Execution Plan will be reviewed only by the City and not necessarily by the Third Party or Utility Owner. Principal Project Company shall promptly address review comments to the Draft Project Execution Plan.

D. Upon resolution of outstanding comments, Principal Project Company shall submit each finalized Project Execution Plan, concurrently, for review and acceptance by the City and Utility Owner.

E. The Project Execution Plan shall provide detail of and understanding of the work to be performed and shall contain, at a minimum:

1. Detailed procedures not otherwise enumerated in the Utility Agreement or Third Party agreement for the Utility Work, Principal Project Company's Third Party Work, inspection, and acceptance of facilities or other work to be owned by the Utility Owner or Third Party upon completion.
2. Detailed procedures for Submittals in accordance with the Third Party Agreement, Utility agreement, and other submittal requirements of the Contract Documents.
3. The Submittal List as relates to the Third Party or Utility Owner, which shall be coordinated and updated.
4. Principal Project Company's approved Project Schedule relevant to scope of Utility Work or Principal Project Company's Third Party Work.
5. Standards, responsibilities and procedures for design and review of the Utility Work or Third Party Work.
6. Standards, responsibilities and procedures for performance of the Utility Work or Third Party Work.
7. Standards, responsibilities and procedures for any inspection, testing and acceptance of facilities or other work required prior to acceptance (including, with respect to Utility Owners, placing facilities into service).
8. Standards, responsibilities and procedures for quality assurance and quality control of the Utility Work or Third Party Work.
9. The scope and timeline for development of operations and maintenance procedures necessary for Utility Work or Principal Project Company's Third Party Work, if any. and
10. Any information, plan or procedure specifically called for in the Utility agreement or Third Party agreement, as applicable.

F. The Project Execution Plan may neither expand nor diminish Principal Project Company's rights and privileges under this Agreement and remainder of the Contract Documents, or under the Utility Agreement or Third Party Agreement, as applies.

G. The Project Execution Plan may neither expand nor diminish Principal Project Company's rights and privileges under this Agreement and remainder of the Contract Documents, or under the Utility Agreement or Third Party Agreement, as applies. Refer to Article 7.6.11 (Utility Betterments) of the Agreement for provisions with respect to Betterments.

1.13.3. Utility Tracking Report

A. Principal Project Company shall, at least monthly and otherwise upon the City's reasonable request, deliver to the City and the applicable Utility Owners, a report, the Utility Tracking Report, which shall include the following information (unless otherwise agreed between the Parties):

1. Design interface dates for each Owner Adjusted Utility.
2. The relevant number and execution date of each executed Utility Work Order.
3. Each design agreement execution date.

4. Each construction agreement execution date.
5. The date on which any completed as-built plans were delivered to or by the Principal Project Company, as applicable. and
6. Identification of all changes made since the immediately prior Utility Tracking Report.

1.14. ENABLING AND RELATED PROJECTS

1.14.1. Enabling Projects

A. Table 3 Enabling Projects/Tasks identifies enabling projects associated with the Project. Principal Project Company shall address the timing of these projects in the Project Schedule.

Table 3: ENABLING PROJECTS/TASKS

LULEP Task #	Project Name	Scope of Work	Start of Work	End of Work
		TABLE IS INTENTIONALLY LEFT BLANK		

1.14.2. Related Projects

A. Principal Project Company shall coordinate and be aware of Related Projects that are occurring on or around the Project Site during the D&C Period that will directly interface with Principal Project Company's Work, including those listed in Table 4 Related Projects. Construction logistics as well as sharing of haul routes and equipment will need to be coordinated with the City and the other contractors. Principal Project Company shall make itself aware of the status and progress of Related Projects and shall coordinate interface requirements with each Related Project.

Table 4: RELATED PROJECTS

Interface Obligation	Project Name	Scope of Work	Responsible Party
Coordination	WD-2801 8- and 12-Inch Ductile Iron Water Main Replacement, 16-Inch Earthquake Resistant Ductile Iron Water Main Installation, Sewer Replacement, and Pavement Renovation, from Mariposa Street to Cesar Chavez on York and Hampshire Streets	Replace and provide redundancy to the aging pipelines of San Francisco's water distribution system, replace aging sewer facilities, and renovate pavement. The work to be performed under this contract includes the installation of 8-, 12- and 16-inch ductile iron and 16-inch earthquake resistant ductile iron water pipe, installation of 12-inch vitrified clay sewer pipe, construction of curb ramps, and pavement renovation.	SFPUC (June 2023 - Oct 2025*) * Scope near Project Site is anticipated to be completed prior to Spring 2025

Interface Obligation	Project Name	Scope of Work	Responsible Party
Coordination	WW-726 Various Locations Sewer Replacement No. 15	Sewer rehabilitation from Potrero Avenue to Hampshire Street on Mariposa Street.1	SFPUC (July 2024 - Jan 2026*) * Scope on Mariposa ~2 months
Coordination	WW-741 Various Locations Spot Main Sewer Replacement No. 1	Partial sewer replacement from Hampshire Street to Bryant Street on 17th Street.	SFPUC (Nov 2024 - Aug 2025*) * Confirming with SFPUC that this scope along 17th Street is still included in their construction contract
Coordination	1850 Bryant Street	New construction of 6-story life sciences facility.	Lighthouse Real Estate (TBD*) * Construction timeline TBD; currently pulling building permits

1.15. COMMUNICATIONS AND PUBLIC INFORMATION

A. The City and Principal Project Company shall jointly maintain an open dialogue with the public, businesses, community groups and organizations, Emergency services, affected Third Parties, and Utility Owners with facilities potentially impacted by Principal Project Company's means and methods in delivering the Project during the D&C Period. Such communication shall support building a long-term relationship between Principal Project Company and Stakeholders based on mutual trust and respect.

B. All public information and communication materials shall meet ADA requirements. All public information and communication materials shall be provided in both English and Spanish.

C. Principal Project Company shall obtain permission from trademark owner for all uses of all trademarks.

1.15.1. Media and Communications

1.15.1.1. Media and Communications Team Contacts

A. City must designate at least two (2) City staff members authorized to receive notices and communicate with Principal Project Company about all public outreach program matters (each, the "City Project Communications Team Contact") and designate at least two (2) City staff members authorized to receive notices and communicate with Principal Project Company about all media matters (each, the "City Media Contact")

B. Principal Project Company must designate at least one person (the "Principal Project Company Project Communications Team Contact") who will be authorized to receive notices and communicate with City about the public outreach program matters and designate at least one person (the "LD Media Contact") who will be authorized to receive notices and communicate with City about all media matters. Either Party shall have the right to change the persons designated as their respective Communications Team Contact and Media Contact by delivering written notice of that change to the other Party.

1.15.1.2. Press Contacts

A. Principal Project Company must not speak with the press or social media about the Project, its negotiations with City or submittals to City, or Principal Project Company's proposed development concepts, plans, phasing or uses (collectively, "Press Matters") that have not been approved by City in writing for public release.

B. A "Press Release" means any written press release, advertisement, or other formal communication to any media outlet (including newspapers, local blog, radio and television stations, and web sites). Principal Project Company agrees it will provide the City Media Contact with a draft copy of any Press Release with no less than three (3) Business Days' prior notice before its proposed release and will not issue any Press Release that has not been approved by the City Media Contact. City will have the right to issue its own separate Press Releases.

C. The Principal Project Company Outreach Plan, see below, will govern Principal Project Company's Press Releases and Principal Project Company's media contacts unless City gives Principal Project Company written notice (a "Noncompliance Notice") that Principal Project Company has not kept City informed of Principal Project Company media's activities with respect to the Project as required in the Principal Project Company Outreach Plan. As of the date of a Noncompliance Notice, Principal Project Company may not issue, nor permit or authorize any other party to issue, any Press Release relating to the Project, its negotiations with City or submittals to City, or Principal Project Company's proposed development concepts, plans, phasing or uses that have not been approved by the City Media Contact in writing for public release.

1.15.1.3. Press Conference or Media Activity

A. Principal Project Company agrees not to hold any press conference or media activities regarding any Press Matters without first inviting the City Media Contact to be present, or have another City representative to be present, at the press conference or media activity and obtaining the City Media Contact's consent to the press conference or media activity. Principal Project Company must provide the City Media Contact with no less than five (5) Business Days' prior notice of the date and time of any proposed press conference or media activity and state in detail the purpose of the press conference or media activity and the topics to be discussed ("Conference/Media Summary"). The City Media Contact must review the Conference/Media Summary promptly and advise Principal Project Company of any comments by 5:00p.m. on the day before the press conference/media activity. If the City Media Contact does not respond within two (2) Business Days of receiving the Conference/Media Summary, the Conference/Media Summary will be deemed approved.

B. Principal Project Company must make reasonable efforts to schedule the press conference or media activity to accommodate the schedules of the City representatives designated to attend by the City Media Contact. If City reasonably believes the proposed press conference/media activity would adversely affect its interests, then City shall have the right to withhold its consent to Principal Project Company holding the press conference or media activity, even if the press conference or media activity may further Principal Project Company's interests.

C. City is entitled to withhold its consent to a Press Release, proposed press conference or media activity by Principal Project Company, or a Conference/Media Summary if the City believes it would adversely affect the City's relationship with the public or a regulatory agency or adversely affect a regulatory agency's decision regarding any Regulatory Approvals. If the City Media Contact reviews a Press Release or Conference/Media Summary and believes that revisions or changes are advisable and appropriate, Principal Project Company must make the those suggested revisions or changes irrespective of whether it may further Principal Project Company's interests.

D. Principal Project Company must timely notify the City Media Contact of media inquiries regarding the Project received by Principal Project Company and Principal Project Company's proposed response. The City Media Contact can waive any of the notice periods required under Section 7.6 (Community Outreach and Public Relations) in writing or by telephone.

1.15.2. Public Outreach and Engagement

1.15.2.1. City Public Outreach and Engagement Program

A. The City will lead the stakeholder outreach to the following parties (the "City Outreach Parties"): City staff, SFMTA staff, the SFMTA Citizens' Advisory Council, other SFMTA working and advisory groups, the SFMTA Board, the Board of Supervisors (and its committees and members), City departments, and other City regulatory agencies. This outreach (the "City Public Outreach and Engagement Program") will be to educate the City Outreach Parties and address any of their questions regarding the Bus Yard Component. Principal Project Company must not initiate any outreach for matters within the City Public Outreach and Engagement Program. Principal Project Company must forward any questions or information requests it receives from the City Outreach Parties for matters within the scope of the City Public Outreach Program (other than those raised by a Regulatory Agency in connection with a Regulatory Approval) to a City Project Communications Team Contact and notify the questioner or requester that it is doing so.

1.15.2.2. Principal Project Company Support

A. Principal Project Company must use commercially reasonable efforts to support the City Public Outreach and Engagement Program by taking the following actions:

1. Attending meetings scheduled by the City with members of the public and any of the City Outreach Parties to describe the Bus Yard Component, the Common infrastructure, or the Infrastructure Facility, provided the City shall provide at least five (5) Business Days' prior notice of such meetings to Principal Project Company.
2. Providing supporting materials for those meetings, as requested by the City
3. Collaborating with the City on any written materials provided by the City to Principal Project Company for the City Public Outreach and Engagement Program
4. If the City requests Principal Project Company to provide supporting materials for the meetings described above or input on any materials described above, Principal Project Company must make commercially reasonable efforts to provide those materials or that input within three (3) Business Days following its receipt of the City's request; if such supporting materials cannot be reasonably provided within such three (3) Business Day period, then Principal Project Company must provide them as soon as reasonably possible.

1.15.2.3. Public Outreach and Engagement Plan

A. Principal Project Company shall develop a Public Outreach and Engagement Plan (the "Public Outreach Plan") and submit for City's review. Once approved by City, Principal Project Company must comply with the processes and requirements of the Public Outreach Plan. Principal Project Company will work collaboratively with City to ensure that the goals of the Public Outreach Plan are met, and address any needed changes to Public Outreach Plan during the Term.

B. Principal Project Company shall develop the Public Outreach Plan using City's Communications Division's Public Outreach and Engagement Requirements (POER) v.1.0, which is included in Division 9 of the Technical Requirements. The Public Outreach Plan also must conform to the process described in the Public Outreach and Engagement Plan Guide included as an attachment to Division 9 of the Technical Requirements.

C. At a minimum, the Public Outreach Plan shall provide for the requirements herein and referenced herein and shall:

1. Identify community stakeholders and describe planned engagement with stakeholders, including those located within a minimum of 900 feet of the Project Site:
    a. Local residents (renters and homeowners)
    b. Neighborhood and merchant groups
    c. Businesses
    d. Property owners (business improvement districts, etc.)
    e. Faith-based institutions
    f. Cultural organizations
    g. Community-based organizations
2. Identify opportunities for community stakeholders to provide input and influence the Project including in developing alternatives and formulating solutions.
3. Detail outreach and engagement techniques that will be used to inform the public and solicit stakeholder input that could affect the Project, including multi-channel, multilingual communications tactics, community meetings, and other outreach methods.
4. Develop key messages for both general and specific audiences.
5. Establish a schedule for public outreach and engagement activities and tasks.
6. Establish a budget to fund the City Public Outreach and Engagement Program and Public Outreach Plan to safely and effectively engage with Project stakeholders through each Project phase (i.e. i.e. Project led events, community tabling events, sponsoring community events, collateral mailers, newspaper, radio and online ads, brochures, flyers, posters/signage, website/digital content, stakeholder giveaways, hand sanitizers, t-shirts, tote bags, water bottles, and other forums for educating the public).
7. Ensure that stakeholder contact information and correspondence is sent weekly to the City Project Communications Team Contact in order to update their stakeholder database.

D. Propose, plan, and schedule regular stakeholder updates by email, physical mailers, or in-person or virtual meetings when appropriate. These various communications channels are intended to keep Project stakeholders informed as the Project progresses. The proposed schedule of in-person and/or virtual meetings may be based on time, such as quarterly, and or may track to key Project milestones or community decision points for the Project.

1.15.2.4. Potrero Yard Neighborhood Working Group

A. Commencing on the Effective Date, Principal Project Company will take the lead in facilitating, attending and sufficiently funding regular Potrero Yard Neighborhood Working Group meetings and activities during the Term. Prior to the Effective Date, the Potrero Yard Neighborhood Working Group generally met on a monthly basis.

1.15.3. Project Tours

A. From time to time, representatives of public agencies, community-based organizations, elected officials, and others may wish to tour the Project Site. Principal Project Company shall accommodate reasonable requests for Project tours, provided notice of not less than seven Days is provided, bearing in mind both the need for positive community engagement and the safe and timely prosecution of the Work.

Appendix A

IT and Communications Scope Allocation

Information technology and communications (together, IT/Comms) requirements are included in Division 3 of the Technical Requirements. City-Furnished IT/Comms is the subject of an Allowance. For avoidance of doubt, the following defines the scope of the IT/Comms systems for the BYC in two groups and provides clarity on the scope allocation between Principal Project Company and the City:

- **Table 5** defines the IT/Comms Infrastructure that Principal Project Company will be responsible for. This IT/Comms Infrastructure is generally defined as the fixed infrastructure in the BYC including IT/Comms rooms and their corresponding HVAC, cabling distribution support hardware (e.g., such as raceways and conduits), power feeds, etc.
- **Table 6** defines the IT/Comms Equipment that the Principal Project Company or the City will be responsible for. This IT/Comms Equipment is generally defined as equipment in the BYC including servers, network switches, LAN/Wifi networking equipment and cabling, displays, etc. This table allocates responsibilities for specific items of the IT/Comms Equipment to the Principal Project Company or the City – items allocated to the City will be furnished, installed, operated, and maintained by the City and subject to the City-Furnished IT/Comms Allowance, unless noted otherwise in Table 5.

The IT/Comms Systems associated with the Common Infrastructure will be designed, procured, and installed, unless noted otherwise, by the Principal Project Company and maintained as part of the IFM Services.

Table 5: Scope of Work for the Infrastructure Facility's IT/Comms Infrastructure

Component of the IT/Comms Infrastructure	Principal Project Company	City	Notes
Facility infrastructure, rooms, pathways, Telecom vaults, and the MEP and Fire Protection systems required to support them	X		Provision and maintenance responsibility of the Principal Project Company.
In-building pathways and distribution	X		Provision and maintenance responsibility of the Principal Project Company. Horizontal cable trays and EMT conduit are acceptable.

EMT = Electrical Metal Tubing

MEP = Mechanical, Electrical, and Plumbing

Table 6: Scope of Work for the Infrastructure Facility's IT/Comms Equipment

Component of the IT/Comms Equipment	Principal Project Company	City-Furnished IT/Comms FF&E	Subject to Allowance	Notes
Incoming Service – Telephone		X		City orders or coordinates installation of telephone service via the Principal Project Company.
Incoming Service – Private Circuits		X		City orders or coordinates installation of private circuits via the Principal Project Company.
Incoming Service – Internet		X		The City provides internet service for Wireless LAN.
Fit-out of IT/Comms Infrastructure spaces	X			Includes racks, pathways, and grounding system.
Active network and switches		X	X	The City will furnish and install the permanent network switches. The Principal Project Company needs to outfit the BYC for the City's network to be functional, including running cabling for the appropriate data drops to workspaces and offices per the Principal Project Company's design, and installing appropriate cable trays and conduit to properly route and support the cabling.
Fit-out of Security Office	X			Includes furniture and connectivity – see Division 3 (*Design Criteria Document*) of the Technical Requirements. The City provides the needed technology. Principal Project Company will provide the FF&E similar to a Class A office.
PC's, displays, RTLS, and other equipment		X	X	City procures, installs, maintains, and manages any equipment that the City needs in the BYC.
Backbone cabling (fiber, multipair copper, and coax)	X			Provision and installation responsibility of the Principal Project Company.
Horizontal/distribution cabling (in-building and on-site)	X			Provision and installation responsibility of the Principal Project Company.
Tel/data terminations, patch panels, and outlets	X			Provision and installation responsibility of the Principal Project Company.

Component of the IT/Comms Equipment	Principal Project Company	City-Furnished IT/Comms FF&E	Subject to Allowance	Notes
Digital signage	X			Provision and installation is the responsibility of the Principal Project Company. Digital signage is not specifically required by Division 3 (*Design Criteria Document*) of the Technical Requirements. If Principal Project Company recommends digital signage, the Principal Project Company will be responsible for its provision and installation and this will not constitute a Change.
Component of the IT/Comms Equipment	**Principal Project Company**	**City-Furnished IT/Comms FF&E**		**Notes**
Master clock system and display clocks	X			Provision and installation is the responsibility of the Principal Project Company. City will provide content for master clock. A master clock system is not specifically required by Division 3 (*Design Criteria Document*) of the Technical Requirements. If during design the LD or Principal Project Company recommends a master clock system, the Principal Project Company will be responsible for its provision and maintenance. The City will review content and performance
Distributed antenna system for cellular/private mobile radios	X			Provision and maintenance responsibility of the Principal Project Company. The City prefers a neutral host.
Wireless LAN (-65 dB on 95% of site 99.9% availability)	X	X	X (for WAP devices only)	The Principal Project Company shall install conduit and Ethernet cabling to each of the wireless access points (WAPs). The City will provide the WAP devices, and Principal Project Company shall install WAP devices. The Principal Project Company shall propose the locations of the WAP devices, subject to City approval, prior to Principal Project Company's installation of WAP devices. The Principal Project Company will be responsible for proposing locations and installing the hardware. The Principal Project Company is expected to design based on predictive analysis and will run appropriate network cabling. The City will be responsible for

Component of the IT/Comms Equipment	Principal Project Company	City-Furnished IT/Comms FF&E	Subject to Allowance	Notes
				configuring the hardware, perform surveys, and create heat maps after the WAP installation.
Office automation systems (email, fileservers, etc.)		X		City provides, operates, and maintains.
Geographical Information Systems		X		City provides, operates, and maintains.
CCTV cameras	X			Provision, installation, and maintenance responsibility of the Principal Project Company.
Other IT/Comms Equipment		X	X	City provides, installs, operates, and maintains.

dB = decibels
FF&E = furniture, fixtures, and equipment
LAN = local area network
WAP = wireless access points

Appendix B

Initial List of Submittals

Potrero Yard - Technical Requirements

Exhibit 18, Division 01 - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Section Reference	Contract Data Item Title / Description	Required Submission Timing	City Submittal Action	Notes/Comments
001	1.1.1. - A	Project Management Plan	NTP 1 + 15 Days	Approval	
002	1.1.3 - D	Project Meeting Agendas and Materials	3 Business Days before meeting	Review/Comment	
003	1.1.3 - D	Project Meeting Minutes	3 Business Days after meeting	Review/Comment	
004	1.1.3.1	Project Work Initiation Meeting Agenda	3 Business Days before meeting	Review/Comment	
005	1.1.3.1	Project Work Initiation Meeting Minutes	3 Business Days after meeting	Review/Comment	
006	1.1.3.2	Design Initiation Meeting Agenda	3 Business Days before meeting	Review/Comment	
007	1.1.3.2	Design Initiation Meeting Minutes	3 Business Days after meeting	Review/Comment	
008	1.1.3.3	Construction Initiation Meeting Agenda	3 Business Days before meeting	Review/Comment	
009	1.1.3.3	Construction Initiation Meeting Minutes	3 Business Days after meeting	Review/Comment	
010	1.1.3.4	Quality Initiation Meeting Agenda	3 Business Days before meeting	Review/Comment	
011	1.1.3.4	Quality Initiation Meeting Minutes	3 Business Days after meeting	Review/Comment	
012	1.1.3.5	Environmental Compliance Initiation Meeting Agenda	3 Business Days before meeting	Review/Comment	
013	1.1.3.5	Environmental Compliance Initiation Meeting Minutes	3 Business Days after meeting	Review/Comment	
014	1.1.3.6	Weekly Project Coordination Meeting Agenda	3 Business Days before meeting	Review/Comment	
015	1.1.3.6	Weekly Project Coordination Meeting Minutes	3 Business Days after meeting	Review/Comment	
016	1.1.3.7	Monthly Progress Meeting Agenda	3 Business Days before meeting	Review/Comment	
017	1.1.3.7	Monthly Progress Meeting Minutes	3 Business Days after meeting	Review/Comment	
018	1.1.4.- B	Key Personnel Register	NTP 1 + 5 Days	Approval	
019	1.1.4. - C	Candidate Key Person Replacement Resume and References	21 Days before anticipated start	Approval	
020	1.1.6	Regulatory Approvals Plan	NTP 1 + 30 Days	Review/Comment	
021	1.1.7.1. - A	Design Management Plan	NTP 1 + 30 Days	Review/Accept	
022	1.1.7.2. - A	Construction Management Plan	NTP 1 + 60 Days	Approval	
023	1.1.8	IFM Management Plan		Approval	
024	1.2.1.2. - A	Project Schedule	Final (Project Scheudle): Initial City Response + 14 Days	Approval	
025	1.2.1.2. - A	Revised Project Schedule	Within 10 Days after criteria occurs	Approval	
026	1.2.1.4. - A	Proposed Recovery Schedule	Within 15 Days after criteria occurs	Approval	
027	1.2.1.5. - A	Project Schedule Monthly Updates	Monthly: 3 days before Monthly Progress Meeting	Review/Comment	
028	1.2.1.6	D&C Submittal Schedule	Initial: Project Schedule + 7 Days Final: Initial City Response + 14 Days	Review/Accept	
029	1.2.1.7	Lookahead Activity Reports	3 Business Days prior to Weekly Coordination Meeting	Information	
030	1.2.4.1	Monthly Progress Status Report	3 Business Days before Monthly Progress Meeting	Review and Comment	
031	1.2.5	As-Built Schedule and Final Schedule Report	as a precondition for Final Acceptance	Approval	
032	1.2.6. - A	Time Impact Analysis	with any requests of claims for extension in Contract Time	Approval	
033	1.3.C	List of Submittals	Initial: Financial Close + 30 Days Updates: Monthly in Progrss Status Report, more frequent if necessary	Review/Accept	
034	1.4.1	PPC Quality Program Plan (PQPP)	Initial: NTP 1 + 30 Days Updates: Monthly in Progrss Status Report, more frequent if necessary	Review/Accept	
035	1.4.1.4	Product Identification, Availability, and Traceability			
036	1.4.1.7.B	Control of Inspection, Measuring, and Test Equipment			
037	1.4.1.9	Control of Nonconforming Work			
038	1.4.1.11	Control of Quality Records			
039	1.4.1.12	Quality Audits			
040	1.4.1.13	Training			
041	1.4.2	PPC Design Quality Plan (PDQP)	NTP 1 + 15 Days	Review/Accept	
042	1.4.3	PPC Construction Quality Plan (PCQP)	NTP 1 + 75 Days	Review/Accept	
043	1.4.3.1 - F	Candidate Independent Testing Laboratory Credentials	60 Days before planned testing at that ITL	Review/Accept	
044	1.4.3.1 - G	ITL Portable and Satellite Policies and Procedures	5 Days after the City request received	Information	
045	1.4.3.3	Material and Equipment Conformance Certifications	5 Days after the City request received	Information	
046	1.4.3.3 - C	Source of Supply Compliance Certifications	5 Days after the City request received	Information	
047	1.4.3.4 - D	Construction Quality Work Plans (CQWP)	15 Days before related Construction Work activity/phase	Review/Comment	
048	1.4.4 - C	PPC response to the City Quality Oversight Reports	5 Days after the City report received	Approval	
049	1.4.5 - A	Software Quality Assurance Plan (SQAP)	NTP 1 + 90 Days	Review/Accept	
050	1.4.5 - B	Software Design Documentation	NTP 1 + 90 Days	Information	
051	1.5	Existing Conditions			
052	1.5.1 - A	Pre-construction Survey Reports	20 Days prior to related construction	Information	
053	1.5.1 - A	Post-construction Survey Reports	120 Days after related construction	Information	
054	1.6	Information Management Plan (IMP)	NTP 1 + 60 Days	Approval	

Potrero Yard - Technical Requirements

Exhibit 18, Division 01 - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Section Reference	Contract Data Item Title / Description	Required Submission Timing	City Submittal Action	Notes/Comments
055	1.6.3 - A	As-Built Documents	Collectively: prior to Final Acceptance	Approval	
056	1.7 - B	Training Procedures, Materials and Records Plan	Initial: 270 Days before Substantial Completion Final: before Substantial Completion	Review/Comment	
057	1.8.5.2	50% Design Development (50% DD) Proporietary Design Review Deliverable	at 50% Design Development	Review/Comment	
058	1.8.5.2	100% Design Development (100% DD) Proporietary Design Review Deliverable	at 100% Design Development	Review/Comment	
059	1.8.5.2	50% Construction Documents (50% CD) Proporietary Design Review Deliverable	at 50% Construction Documents	Review/Comment	
060	1.8.5.2	90% Construction Documents (90% CD) Proporietary Design Review Deliverable	at 90% Construction Documents	Review/Comment	
061	1.8.5.2	100% Construction Documents (100% CD) Proporietary Design Review Deliverable	at 100% Construction Documents	Review/Comment	
062	1.8.5.2.3	Basis of Design Report			
063	1.8.6.1 - B	Design Review Report	15 Days after each Design Review / Workshop	Information	
064	1.9.1	Sustainability Management Plan	NTP 1 + 4 Months	Review/Comment	
065	1.10.2	BIM Project Execution Plan	NTP 1 + 60 Days	Review/Comment	
066	1.11.2.2	Site Security Plan (SSP)	NTP 1 + 60 Days	Review/Comment	
067	1.11.2.3	Security Requirements	24 hours after City request		
068	1.11.3.1 - A	Transportation Management Plan (TMP)	60 Days before start of each phase of each Construction Work zone	Review/Comment	
069	1.11.3.2.1	Traffic Control Plan (TCP)	Initial: 30 Days before start of each phase of each Construction Work zone Updates: Monthly in Progress Status Report, more frequent if necessary	Review/Comment	
070	1.11.3.5 - F	Haul Routes	60 Days before start of each phase of each Construction Work zone	Review/Comment	
071	1.11.4.1 - C	Temporary Utility Designs and Engineered Drawings	Per Utility Agreement	Information	
072	1.11.4.3	Construction Management Office Plans	45 Days prior to planned office occupancy	Approval	
073	1.12.2	Third Party Coordination Work Plan (one per Third Party)	NTP 1 + 30 Days	Information	
074	1.12.3	Third Party Project Execution Plan (one per Third Party)	NTP 1 + 60 Days	Review/Accept	
075	1.13.1	Utility Coordination Work Plan (UCWP) (one or more per Utility Owner)	Initial: NTP 1 + 30 Days Update: Monthly in Progress Status Report	Information	
076	1.13.1	Project Utility Plans	Monthly	Information	
077	1.13.2	Utility Project Execution Plan (one per Utility Owner)	NTP 1 + 60 Days	Review/Accept	
078	1.13.3	Utility Tracking Report	Monthly, more frequent if neessary	Information	
079	1.15.2.3	Public Outreach and Engagement Plan (PPC Outreach Plan)	Initial: NTP 1 + 60 Days Updates: Monthly in Progress Status Report	Approval	

Potrero Yard - Technical Requirements

Exhibit 18, Division 03 - Initial List of Submittals

Date of update:	15-Nov-24				
ID Number	**Section Reference**	**Contract Data Item Title / Description**	**Required Submission Timing**	**City Submittal Action**	**Notes/Comments**
001	4.1.1 Slab on Grade	Design and locate joints to control and direct shrinkage cracking of concrete elements per ACI recommendations. Submit a Joint Plan.	60 days prior to placing exposed slabs and walls.	Review/Comment	
002	4.3 Exterior Enclosures	Project aesthetics package	include in 50% Design Development (50% DD) Proporietary Design Review Deliverable	Approval	
003	4.3.4 Exterior Masonry	Material sample(s), mock-ups, shop drawings, anchorage, and reinforcing materials.	include in 50% Design Development (50% DD) Proporietary Design Review Deliverable	Approval	
004	4.3.6 Precast Architectural Concrete	Product data and samples, mock up, and shop drawings.	include in 50% Design Development (50% DD) Proporietary Design Review Deliverable	Approval	
005	4.3.12 Glazing	12-inch by 12-inch samples for each glass type with fabricator product information.	include in 50% Design Development (50% DD) Proporietary Design Review Deliverable	Approval	
006	4.3.31 Expansion Control	Submit movement control diagrams addressing full structure. Submit calculations and rationale for joint locations, types and sizes. Expansion control elements shall match or be of a compatible color with the adjacent materials.	include in each Proporietary Design Review Deliverable, see Div 01, Section 1.8.5	Approval	
007	4.4 Interior Consturction	Submit for approval by the SFTMA product data, certificates and test reports verifying materials selected conform to performance standards listed in this document.	include in each Proporietary Design Review Deliverable, see Div 01, Section 1.8.5	Approval	
008	4.5.5 Expansion Control	Submit movement control diagrams addressing full structure. Submit calculations and rationale for joint locations, types and sizes. Expansion control elements shall match or be of a compatible color with the adjacent materials.	include in each Proporietary Design Review Deliverable, see Div 01, Section 1.8.5	Approval	
009	4.8 Conveying - Elevators	The PPC shall submit 3-inch by 12-inch samples of actual finished material for review of color, pattern, and texture of exposed finishes.	include in 50% Design Development (50% DD) Proporietary Design Review Deliverable	Approval	
010	4.10 HVAC	Submit ventilation plan demonstrating compliance with this article before submitting it to the San Francisco Department of Public Health for review and approval prior to submitting mechanical drawings for approval.	include in each Proporietary Design Review Deliverable, see Div 01, Section 1.8.5	Approval	
011	4.13 Electrical	Submit the following calculations and analyses, sealed by a Registered Professional Engineer: Demand load as calculated per requirements of NFPA 70 Article 220. Lighting Photometrics: Submit point-by-point calculations for 100 percent of the site and each unique room type in the buiPPCings. Submit separate calculations proving compliance with NFPA 101 for emergency/egress lighting. Emergency generator – provide calculations proving the capability of the proposed generator to serve the required emergency loads plus 25 percent spare capacity. The analysis shall assume the spare capacity load to be constant kVA load. Analysis shall include starting of motor loads as sequenced by the BAS. Calculations shall assume generator operation with diesel fuel source. A diesel-fueled engine generator set shall provide power for the emergency/standby system loads. Short circuit – provide calculated momentary (0.5 cycle) fault current values for all 15 kV and 480V busses, and 208/240V panels served from 75 kVA or larger transformers. Arc flash (hazard analysis, arc flash boundary, incident energy) – provide calculation results for all busses 150V (AC and DC) and greater. Voltage drop – provide calculations for the main buiPPCing services, feeders longer than 50-feet, all site lighting branch circuits, and all branch circuits longer than 75-feet or loaded greater than 50 percent of the circuit rating. Protective device coordination – provide time-current curve (TCC) plots showing proper coordination of all panel main breakers with upline devices, coordination of switchboard feeder breakers with main breakers and coordination of switchboard main breakers with 15 kV feeder relaying. Fire Alarm – provide battery capacity calculations proving compliance with NFPA 72. UPS – provide battery capacity calculations.	include in each Proporietary Design Review Deliverable, see Div 01, Section 1.8.5	Approval	
012	4.13.1 Building Power Distribution	The PPC shall submit calculations which support the required size of the UPS and batteries. The UPS input shall be fed from the generator or the secondary utility feed for continued operation following the rated load period of 90 minutes. A diesel-fueled engine generator set shall provide power for the emergency/standby system loads.	include in each Proporietary Design Review Deliverable, see Div 01, Section 1.8.5	Approval	
013	4.13.9 Closed Circuit Television System (CCTV)	Camera views will be selected based on their function, location, and resolution. The PPC shall submit the CCTV design site plan that shows camera locations, coverage, camera function and the camera model for each location. Submittal shall also include required views generated from the project 3D model from each camera location.	include in each Proporietary Design Review Deliverable, see Div 01, Section 1.8.5	Approval	
014	4.13.9 IT Equipment Procurement	The PPC shall submit the CCTV design site plan that shows camera locations, coverage, camera function and the camera model for each location. Submittal shall also include required views generated from the project 3D model from each camera location.	include in each Proporietary Design Review Deliverable, see Div 01, Section 1.8.5	Approval	

Potrero Yard - Technical Requirements

Exhibit 18, Division 04 - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Section Reference	Contract Data Item Title / Description	Required Submission Timing	City Submittal Action	Notes/Comments
001	1.5.1	50% Design Development Proporietary Design Review Deliverable	at 50% Design Development	Review/Comment	
002	1.5.2	100% Design Development Proporietary Design Review Deliverable	at 100% Design Development	Review/Comment	
003	1.5.3	50% Construction Documents Proporietary Design Review Deliverable	at 50% Construction Documents	Review/Comment	
004	1.5.4	90% Construction Documents Proporietary Design Review Deliverable	at 90% Construction Documents	Review/Comment	
005	1.5.5	100% Construction Documents Proporietary Design Review Deliverable	at 100% Construction Documents	Review/Comment	
006	1.5.6	Testing Report verifying Project Criteria are met	more than 21 days before Substantial Comepletion	Review/Comment	
007	2.7	Seismic Resilience Peer Review - Principal Project Company shall prepare and submit deliverables, as described in Section 2.9.	as per Table 1 in Section 2.9 of Division 4	Approval	NTD: Approval may not be the right submittal action in drafting. City to confirm.
008	2.8	Podium Roof HCC Alternative - Principal Project Company shall submit the temporary construction loading plan for SFMTA review and concurrence.	with each Design Review Deliverable, as applicable	Review/Comment	
009	2.8	Paratransit Alternative - Principal Project Company shall submit the temporary construction loading plan for SFMTA review and concurrence.	with each Design Review Deliverable, as applicable	Review/Comment	

Potrero Yard - Technical Requirements

Exhibit 18, Division 06 - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Section Reference	Contract Data Item Title / Description	Required Submission	Submittal Action (Proprietary)	Comments/Notes
001	6.6.2.1	Pre-Construction Requirements - Commissioning Plan	Principal Project Company shall prepare and submit to the City for its review and approval no later than NTP2 a Commissioning Plan to evaluate and document that the design, construction, and operation of the Commissioned Systems comply with the Contract Documents.	Approval	
002	6.6.2.2	Pre-Construction Requirements - Review of Design Documentation	In addition to the Commissioning Issues and Resolution Log, for each round of design review, the CxP shall prepare and submit to Principal Project Company a design review memorandum addressing: •List of the documents reviewed; •Laws, standards, and guidelines used to perform the review; and •A summary of the review flagging and describing major issues discovered. The CxP shall submit the design review memorandum and Commissioning Issues and Resolution Log to Principal Project Company, no more than two weeks after the Design Deliverables are submitted for City review. Principal Project Company shall review the comments and respond to each item with acceptance or a response to the comment. All the comments shall be settled by Principal Project Company, D&C Contractor, and CxP. A workshop(s) between the D&C Contractor, Principal Project Company and/or CxP may be held to discuss any comments requiring clarification or discussions or decision by Principal Project Company. The CxP can chair these workshop(s). Any CxP reviews of design documentation prior to NTP 2 may take place before or during the preparation of the Commissioning Plan.	Information	
003	6.6.3.2	Submittals Review	During construction the CxP shall review the Submittals stated in the Commissioning Plan as well as any construction Submittals generated by the D&C Contractor related to Commissioned Systems to verify compliance with the Contract Documents. The CxP shall enter all Commissioning Submittal reviews in the Commissioning Issues and Resolution Log. At a frequency determined by the Commissioning Plan, the CxP shall prepare and submit to Principal Project Company a Submittal review memorandum addressing: •List of the documents reviewed; •Codes, standards and guidelines used to perform the review; and •A summary of the review flagging and describing major issues discovered. The CxP shall notify Principal Project Company of any reviewed submittals that the CxP deems not to meet the requirements of the Contract Documents.	Information	
004	6.6.3.7	Comissioning Report	Principal Project Company shall submit the Commissioning Report to the City for review and approval before Substantial Completion can be achieved.	Approval	
005	6.6.4.1	System Manual	By its nature, the Systems Manual will be a collection of materials already produced by Principal Project Company, the D&C Contractor, or the CxP. Principal Project Company shall submit the Systems Manual to the City for review and acceptance no later than 180 days after Substantial Completion.	Review/Accept	
006	6.6.4.3	Near Warranty End Post Occupancy Review	The PPC shall, one (1) year after the Substantial Completion date, provide written documentation to the City describing what was learned through interviews and investigations into performance of SFMTA O&M Facilities and certain Equipment List items, how issues will be resolved through warranties or other means, and develop a final deficiency and action list. This documentation shall include requests for services to remedy outstanding problems. Principal Project Company shall provide the written documentation to the City for information.	Information	
007	6.6.4.4	On-going Commissioning Plan	For purposes of complying with LEED Enhanced Commissioning and building envelope Commissioning requirements, the CxP shall produce and submit to Principal Project Company an Ongoing Commissioning Plan no later than one year after the Substantial Completion Date. The plan shall provide the Infrastructure Facility operating staff with procedures, blank test scripts, and a schedule for ongoing Commissioning activities.	Information	
008	6.7	Monitoring-Based Commissioning (MBCx)	After MBCx activities are complete, the CxP shall update the Systems Manual with any modifications or new settings and give the reason for any modifications from the original design. Principal Project Company shall submit any revised Systems Manual to the City and the IFM Provider.	Information	
009	6.8	Operational Readiness (OR)	Principal Project Company shall prepare the Operational Readiness Plan and submit it to the City for review and approval no later than 180 days prior to the scheduled Substantial Completion Date. Principal Project Company shall amend and reissue the plan if changes are required. All activities in the Operational Readiness Plan shall be either: (1) completed no later than the Substantial Completion Date; or (2) completed after the Substantial Completion Date as part of the Bedding-In Period activities.	Approval	

Potrero Yard - Technical Requirements

Exhibit 18, Division 07 - Initial List of Submittals

Date of update:

ID Number	Section Reference	Contract Data Item Title / Description	Required Submission Timing	City Submittal Action	Notes/Comments
001	B.5.1 Annual Service Plan	Annual Service Plan	Annually	Review/Accept	Pre Substantial Completion and then Annually revised during operational period
002	B.6 IFM Service Procedures	Service Procedures PPC will develop Service Procedures for the service areas outlined below: (a) General Management i. Communications & Committee Procedures ii. Human Resources iii. Occupational Health and Safety/Risk Management. iv. Quality Management System v. Periodic Reporting (process and templates) vi. Performance Monitoring Program vii. FM Call Center Services. viii. Utilities Management Services ix. Environmental Management System, relative to Environmental and Sustainability Services. x. Emergency Management, including operational risk assessment xi. Fire Management Plan. (b) Project Site & Infrastructure Facility Operations i. Security Services ii. Solid Waste Collection, Recycling, and Removal Services. iii. Pest Control Services iv. Grounds Maintenance Work. v. Cleaning Services vi. Maintenance Work vii. Renewal Work Services	Annually	Review/Comment	Pre Substantial Completion for initial development then revised/updated during operational term.
003	B.6.1 IFM Services Procedures Submission Process	Submittal Schedule	PPC shall submit a schedule of Submittals required under these IFM Specifications at least ten (10) months prior to Substantial Completion Deadline, to commence no later than eight (8) months prior to Substantial Completion Deadline and the final submitted no later than one (1) month prior to Substantial Completion Deadline	Review/Accept	Pre Substantial Completion
004	B.8.1.5. Training and Qualifications	Ensure that all personnel hold up-to-date certification, training and qualifications related to their responsibilities	Annually	Information	Operational period
005	B.8.1.6. Infrastructure Facility Orientation	Orientation Training	Annually	Information	Operational period
006	B.8.1.6. Occupational Health & Safety	Occupational Health & Safety Procedure	Annually	Review/Comment	Pre Substantial Completion for initial development then revised/updated during operational term.
007	B.9.1.2 I FM Operations Committee	Monthly Agenda	Monthly Prepare the agenda and provide at least five (5) Business Days in advance of the meeting.	Information	Operational period
008	B.9.1.2 I FM Operations Committee	Minutes	Monthly Provide not more than five (5) Business Days following the meeting.	Review/Accept	Operational period
009	B.9.4 City Orientation & Training	Orientation Training for City Personnel	Annually	Review/Accept	Pre Substantial Completion and then Annually revised during operational period
010	B11.1 Performance Monitoring Report	Performance Monitoring Report	Monthly PPC shall deliver the monthly reports to City five (5) Business Days following the last day of the month	Review/Accept	Operational period
011	B11.1.2 Operational Report	Operational Report	Monthly PPC shall deliver the monthly reports to City five (5) Business Days following the last day of the month	Review/Accept	Operational period
012	B11.1.3 Maintenance Status Report	Maintenance Status Report	Monthly PPC shall deliver the monthly reports to City five (5) Business Days following the last day of the month	Review/Accept	Operational period
013	B.11.1.4 Renewal Work Report	Renewal Work Report	Monthly PPC shall deliver the monthly reports to City five (5) Business Days following the last day of the month	Review/Accept	Operational period

Potrero Yard - Technical Requirements

Exhibit 18, Division 07 - Initial List of Submittals

Date of update:

ID Number	Section Reference	Contract Data Item Title / Description	Required Submission Timing	City Submittal Action	Notes/Comments
014	B12.1 Annual Summary Report	Annual IFM Services Report	Annually The Annual Summary report shall be provided to City no more than 20 Business Days following the completion of each contract year.	Review/Accept	Operational period
015	B.13 Annual Planned Maintenance and Renewal Work Schedule	Annual Planned Maintenance and Renewal Work schedule	Annually	Review/Accept	Operational period - accept where schedule does not impede SFMTA operations, otherwise not impact.
016	B.16.2 IFM Quality Management Plan	IFM Quality Mangement Plan	Annually	Review/Comment	Pre Substantial Completion and then Annually revised during operational period
017	B.17 Occuprant Satisfaction Surveys	Questions and Methodology	At least two months in advance of survey	Review/Accept	Operational period
018	B.17 .4 Satisfaction Survey Report	Survey Report	Provide survey results and analysis within 30 days of the close of the survey for the occupant satisfaction survey or 30 days after each Quarter for the Transaction Survey.	Review/Accept	Operational period
019	B.17 .4 Satisfaction Survey Report	Action Plan	Provide an action plan within 45 days of the close of the survey if conditions met	Review/Accept	Operational period
020	B.18.2 Performance Action Plans	Performance Action Plans (PAP)	(1)At any time, City may request that PPC prepare and submit a Performance Action Plan (PAP) to address any concerns related to the IFM Work. The PAP will be due either five (5) Business Days from the request or an alternate later date as identified by City.	Review/Accept	
021	B.22.2. Environmental Management System	Relevant Polivies and Processes: (a) Energy conservation. (b) Water conservation. (c) Greenhouse gasses emission reduction. (d) Green materials use. (e) Halocarbons management. (f) Storage tank management (fuel, lubrications, chemicals, etc.). (g) Potable water quality management. (h) Indoor air quality management. (i) Material storage and use. (j) City employee communications. (k) Training. (l) Testing, inspection and auditing.	Annually	Review/Comment	Pre Substantial Completion for initial development then revised/updated during operational term.
022	B.22.1 General Requirements	Annual Environmental Compliance Statement	Annually	Information	Operational period
023	B.22.4 LEED	LEED EBOM Certification	Within five (5) years of Substantial Completion	Information	Operational period
024	B.23.2. Emergency Response	Emergency Response and Mitigation Plans (a) Utility Disruptions (b) Natural Disasters (c) Flood/Water leaks (d) Heating/Cooling failure (e) Weather Events (f) Bomb Threats (g) Fire (including evacuation plan) (h) Environmental Spill / Hazardous Material release (i) Medical Emergency (j) Structural Collapse (k) Pandemics	Annually	Review/Comment	Pre Substantial Completion and then Annually revised during operational period
025	B.23.3 Contingency Planning	Contingency Plans		Review/Accept	Pre Substantial Completion and then Annually revised during operational period
026	B.24	Fire Management & Evacuation	(2)PPC shall submit the fire safety and evacuation plan to the local fire authorities in accordance with legislative requirements prior to Substantial Completion Deadline. PPC will keep the plan up-to-date and make changes as needed to accommodate City Operations.	Review/Comment	Pre Substantial Completion and then Annually revised during operational period
027	B.25 Move-In Services	Move-In Plan	PPC shall submit a Move-In Plan no later than six (6) months prior to Substiantial Completion Deadline	Review/Accept	Pre Substantial Completion
028	C.6.3 Scheduling of Maintenance	Monthly Schedule	PPC must provide City with a monthly schedule at least 1 month in advance of planned Maintenance Work activities to be carried out.	Review/Accept	Operational period - accept where schedule does not impede SFMTA operations, otherwise not impact.

Potrero Yard - Technical Requirements

Exhibit 18, Division 07 - Initial List of Submittals

Date of update:

ID Number	Section Reference	Contract Data Item Title / Description	Required Submission Timing	City Submittal Action	Notes/Comments
029	C..6.7 .1 1 Year Scheduled Maintenance Plan	1 Year Scheduled Maintenance Plan	The plan is to be provided at least 3 months prior to the start of the Year at the IFM Operations Committee.	Review/Accept	Pre Substantial Completion and then Annually revised during operational period
030	C.9.2 5 Year Scheduled Maintenance Plan	5 Year Scheduled Maintenance Plan	The plan is to be provided at least 3 months prior to the start of the Year at the IFM Operations Committee.	Review/Accept	Pre Substantial Completion and then Annually revised during operational period
031	E.2 Renewal Work Plans and Reports	Initial 30- Year Renewal Work Plan	Annually	Review/Accept	Pre Substantial Completion and then Annually revised during operational period
032	E.4 Facility & System Condition Index	Facility Condition Index and System Condition Index	Every 5 years	Review/Accept	Operational Period
033	E.5 Joint Technical Review	Joint Technical Review Report	Every 5 years, a Joint Technical Review to occur.	Review/Accept	Operational Period
034	F.2 Handback	Handback Renewal Work Plan	Within 30 days of the commencement of the 26th Contract Year, and annually thereafter	Approval	Operational Period
035	F.2 Handback	Handback Requirements Recovery Plan	As needed	Approval	Operational Period

Potrero Yard - Technical Requirements

Exhibit 18, Division 09 - Initial List of Submittals

Date of update:	15-Nov-24				
ID Number	**Section Reference**	**Contract Data Item Title / Description**	**Required Submission**	**City Submittal Action**	**Notes/Comments**
001		Public Outreach and Engagement Plan	A report submitted to the POETS webpage after each project phase	Information	

Potrero Yard - Technical Requirements
Exhibit 18, Division 10 - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Division and Section Reference	Subsection Reference	Contract Data Item Title / Description	Required Submission	Submittal Action (Proprietary)	Notes/Comments
001	Div. 10 - Sec. 007320	1.2.A.4.d	EXISTING UTILITIES - Governmental Facilities in the City of San Francisco	PPC shall submit support designs for approval and start work only with approved support designs.	Information	Only applicable if submitted to Governmental Utility
002	Div. 10 - Sec. 007321	2 Contract Activities	UTILITY CROSSINGS - Supporting Documentation for City Projects other than Spot Sewer Repair Contracts	The PPC shall, at a minimum, submit the following supporting documentation with each invoice submitted to the Utility Company for payment:	Information	Only applicable if submitted to Utility Company
003	Div. 10 - Sec. 007321	2 Contract Activities	UTILITY CROSSINGS - Supporting Documentation for work according the Fixed Price Schedule	The PPC shall, submit following documentation with each invoice submitted to the Utility Company for payment for Spot Sewer Repair Contracts:	Information	
004	Div. 10 - Sec. 01140	1.3.A	ARTWORK COORDINATION - Schedule	Dates for Pre-Art Installation Conference, Artwork installation and Artwork acceptance	Information	
005	Div. 10 - Sec. 011400	1.4	ARTWORK COORDINATION - Artwork Submittals	Submit shop drawings, product data, and samples per this section.	Information	
006	Div. 10 - Sec. 011401	1.8.E	ARTWORK COORDINATION - Artwork Quality Assurance - Mock Ups	PPC shall submit all applicable mock-ups per this section	Information	
007	Div. 10 - Sec. 013233	1.2	Photographic Documentation - Pre-construction and Construction photographs	Pre-construction photographs - submit no later than NTP2 - Deliniated by numbers/ letters indicating location on Site plan - Formatt, CD , DVD, USB drive Construction Photographs per requirements in Part 3 - Execution	Information	
008	Div. 10 - Sec. 013543	1.4.A.1.a	ENVIRONMENTAL PROCEDURES - Submittals	Pre-construction survey for nesting birds that may be affected during construction work. (see Article 3.12 of this section)	Review/Comment	
009	Div. 10 - Sec. 013543	1.4.A.1.b	ENVIRONMENTAL PROCEDURES - Submittals	Photographs of existing landscaping at the limit-of-work line(s). (see Article 3.14 of this section)	Review/Comment	
010	Div. 10 - Sec. 013543	1.4.A.1.c	ENVIRONMENTAL PROCEDURES - Submittals	Tree protection fence locations and stake placement provided at least two weeks in advance of the date for any on-site review of the fence and stake placement. (see Article 3.14 of this section)	Review/Comment	
011	Div. 10 - Sec. 013543	1.4.A.1.d	ENVIRONMENTAL PROCEDURES - Submittals	Written and/or photographic documentation of methods for avoidance of Environmentally Sensitive Areas. (see Article 3.11 of this section)	Review/Comment	
012	Div. 10 - Sec. 013543	1.4.A.1.e	ENVIRONMENTAL PROCEDURES - Submittals	A copy of written notice, accompanied by proof of submittal, provided to the Bay Area Air Quality Management District in accordance with the requirement of the "Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations," in advance of roadway construction and maintenance activities in areas soils containing naturally occurring asbestos. (see Article 3.08 of this section)	Review/Comment	see section 3.8
013	Div. 10 - Sec. 013543	1.4.A.1.f	ENVIRONMENTAL PROCEDURES - Submittals	Prior to issuance of construction permits, and prior to commencement of each construction stage, a Project-specific construction noise control plan shall be reviewed and approved by City Planning Department and City. (see Article 3.07 of this section)	Review/Comment	see section 3.7 (not 3.07)
014	Div. 10 - Sec. 013543	1.4.A.1.g	ENVIRONMENTAL PROCEDURES - Submittals	Prior to issuance of construction permits, Principal Project Company's construction emissions minimization plan (CEMP).) shall be reviewed and approved by City Planning Department and City. (see Article 3.06 and 3.20 of this section for CEMP plan requirements)	Information	see Section 3.6 (not 3.06) and 3.20. Information as City Planning Dept has review and approval authority, not City.
015	Div. 10 - Sec. 013543	1.4.A.1.h	ENVIRONMENTAL PROCEDURES - Submittals	Principal Project Company's initial dust control plan (DCP). (see Article 3.03 of this section)	Review/Comment	
016	Div. 10 - Sec. 013543	1.4.A.1.i	ENVIRONMENTAL PROCEDURES - Submittals	SFDPH Permit and notification for removal and installation of fuel or chemical storage tanks (see Article 3.23 of this section)	Review/Comment	
017	Div. 10 - Sec. 013543	1.4.A.1.j	ENVIRONMENTAL PROCEDURES - Submittals	SFDPH Well Construction/Decommissioning or Soil Borings Permit (see Article 3.23 of this section)	Review/Comment	
018	Div. 10 - Sec. 013543	1.4.A.1.k	ENVIRONMENTAL PROCEDURES - Submittals	Finalized Asbestos Dust Mitigation Plan approved by BAAQMD (see Article 3.09 of this section)	Review/Comment	
019	Div. 10 - Sec. 013543	1.4.A.1.l	ENVIRONMENTAL PROCEDURES - Submittals	Prior to issuance of construction permits, and prior to commencement of each construction stage, a Noise Control Plan shall be reviewed and approved by City Planning Department and City (see Article 3.07 of this section)	Review/Comment	repeat of sub item f above?
020	Div. 10 - Sec. 013543	1.4.A.1.m	ENVIRONMENTAL PROCEDURES - Submittals	San Francisco Public Works Night-Noise Permit (see Article 3.10 of this section)	Review/Comment	
021	Div. 10 - Sec. 013543	1.4.A.1.n	ENVIRONMENTAL PROCEDURES - Submittals	Prior to issuance of a construction permit, an Archeological Monitoring Plan shall be reviewed and approved by City Planning Department.	Information	City Planning Dept only (not City)
022	Div. 10 - Sec. 013543	1.4.A.1.o	ENVIRONMENTAL PROCEDURES - Submittals	The issued Construction Project Site Runoff Control Permit for the project from the SFPUC with written and schematic summary of details. (see Article 3.21 of this section)	Review/Comment	
023	Div. 10 - Sec. 013543	1.4.A.1.p	ENVIRONMENTAL PROCEDURES - Submittals	The issued WDID for the Stormwater Pollution Prevention Plan (SWPPP) from the Regional Water Quality Control Board with certified SWPPP inspection checklist. (see Article 3.22 of this section)	Review/Comment	
024	Div. 10 - Sec. 013543	1.4.A.1.q	ENVIRONMENTAL PROCEDURES - Submittals	(Not Used)	Review/Comment	
025	Div. 10 - Sec. 013543	1.4.A.1.r	ENVIRONMENTAL PROCEDURES - Submittals	Underground Storage Tank (UST) Permit (see Article 3.23 of this section)	Review/Comment	
026	Div. 10 - Sec. 013543	1.4.A.1.s	ENVIRONMENTAL PROCEDURES - Submittals	Well Construction/Decommissioning or Soil Borings Permit (see Article 3.23 of this section)	Review/Comment	
027		1.4.A.2	ENVIRONMENTAL PROCEDURES - Submittals	Submit qualifications meet the requirements for the following: - Qualified Acoustical Consultant - Qualified Arborist - Specialty Environmental Monitor - Qualified Historic Architect or Historic Preservation Professional - Qualified SWPPP Practictioner (QSP)	Review/Comment	

Potrero Yard - Technical Requirements
Exhibit 18, Division 10 - Initial List of Submittals

Date of update:	15-Nov-24					
ID Number	**Division and Section Reference**	**Subsection Reference**	**Contract Data Item Title / Description**	**Required Submission**	**Submittal Action (Proprietary)**	**Notes/Comments**
028	Div. 10 - Sec. 013543	1.4.B.1	ENVIRONMENTAL PROCEDURES - Submittals	Principal Project Company shall submit the "ALERT" sheet affidavit within five business days of the start of construction activities. (see Article 3.18 of this section)	Review/Comment	
029	Div. 10 - Sec. 013543	1.4.B.2	ENVIRONMENTAL PROCEDURES - Submittals	(Not Used)	Review/Comment	
030	Div. 10 - Sec. 013543	1.4.B.3	ENVIRONMENTAL PROCEDURES - Submittals	Documentation of disposal in landfill or at a commercial composting facility of plant materials potentially harboring the Phytophthora ramorum pathogen within one week of disposal. (see Article 3.14 of this section)	Review/Comment	
031	Div. 10 - Sec. 013543	1.4.B.4	ENVIRONMENTAL PROCEDURES - Submittals	Certificates of Quarantine Compliance from County Agricultural Commissioner documenting that hay, straw, or mulch used on the project has been inspected and is weed free before installation of stormwater BMPs. (see Article 3.04 of this section)	Review/Comment	
032	Div. 10 - Sec. 013543	1.4.B.5	ENVIRONMENTAL PROCEDURES - Submittals	ESCP inspection checklists transmitted on a monthly basis (see Article 3.21/3.22 of this section)	Review/Comment	
033	Div. 10 - Sec. 013543	1.4.B.6	ENVIRONMENTAL PROCEDURES - Submittals	Notification(s) that Change Orders or other changes in construction conditions will alter the ESCP, and any additional modifications to the ESCP (see Article 3.21/3.22 of this section)	Review/Comment	
034	Div. 10 - Sec. 013543	1.4.B.7	ENVIRONMENTAL PROCEDURES - Submittals	Analytical water-quality monitoring results (see Article 3.21-3.23 of this section)	Review/Comment	
035	Div. 10 - Sec. 013543	1.4.B.8	ENVIRONMENTAL PROCEDURES - Submittals	Noise complaint logs (see Article 3.07 of this section).	Review/Comment	
036	Div. 10 - Sec. 013543	1.4.B.9	ENVIRONMENTAL PROCEDURES - Submittals	Photographic documentation of signage to be posted by the Principal Project Company as required by this section:	Review/Comment	
037	Div. 10 - Sec. 013543	1.4.B.9.a	ENVIRONMENTAL PROCEDURES - Submittals	A sign with the telephone number and a City person to contact regarding dust complaints and the BAAQMD's phone number (see Article 3.03 of this section)	Review/Comment	
038	Div. 10 - Sec. 013543	1.4.B.9.b	ENVIRONMENTAL PROCEDURES - Submittals	Legible and visible posted signs, in English, Spanish, and Chinese, in designated queuing areas and at the construction site to remind operators of the engine-idling limit (see Article 3.06 of this section)	Review/Comment	
039	Div. 10 - Sec. 013543	1.4.B.9.c	ENVIRONMENTAL PROCEDURES - Submittals	Signs on-site pertaining to permitted construction days and hours and noise complaint procedures and who to notify in the event of a problem, with telephone numbers listed (see Article 3.07 of this section)	Review/Comment	
040	Div. 10 - Sec. 013543	1.4.B.9.d	ENVIRONMENTAL PROCEDURES - Submittals	A legible and visible sign summarizing the Construction Emissions Minimization Plan (see Article 3.06 of this section)	Review/Comment	
041	Div. 10 - Sec. 013543	1.4.B.10	ENVIRONMENTAL PROCEDURES - Submittals	Photographic documentation of temporary fence Type ESA at the entire perimeter of ESA -- Biology as shown on the Design Documents (see Article 3.11 and 3.14 of this section).	Review/Comment	
042	Div. 10 - Sec. 013543	1.4.C.1	ENVIRONMENTAL PROCEDURES - Submittals	A final construction emissions minimization plan (CEMP) report summarizing construction activities including the start and end dates and duration of each construction phase, and the specific information required in the CEMP (see Article 3.06 of this section)	Review/Comment	after completion of construction activities
043		3.3.C.2	ENVIRONMENTAL PROCEDURES - Dust Control BMPs	Principal Project Company shall submit a completed application and pay the associated fees to the SFDPH. Principal Project Company may not commence Construction Work, demolition, excavation, grading, foundation work, or other permitted activities until Principal Project Company has submitted to the City's Authorize RepresentativeCity and City Planning Department a copy of SFDPH director's written approval of the DCP, the plan provisions have been implemented, and the City has subsequently given Principal Project Company permission to proceed.		see DCP in Appendix A of the SMP approved by SFDPH Oct 10, 2024
044	Div. 10 - Sec. 013543	3.7.B.3	ENVIRONMENTAL PROCEDURES - Construction Noise Control Best Management Practices	Post a sign onsite describing noise complaint procedures and a complaint hotline number that shall always be answered during construction, and provide to City and City Planning Department photographic documentation that the signage has been posted.	Information	submittal is photograhic evidence of signage being posted
045	Div. 10 - Sec. 013543	3.7.D.3	ENVIRONMENTAL PROCEDURES - Construction Noise Control Best Management Practices	If directed by the City Planning Department, Principal Project Company must revise the Project-specific construction noise control plan and resubmit for City Planning Department review and approval. Principal Project Company's proposed revisions to the construction noise control plan must be prepared by a qualified acoustical engineer and demonstrate to the City Planning Department what alternative measures to reduce the impacts of construction noise to the extent feasible. The revised construction noise control plan must be approved by the City Planning Department and Principal Project Company shall enact all of its provisions before Project Principal Company commences Construction Work that may exceed the standards or omit the controls required above.	Review/Comment	pertains to resubmittal if, before construction mobilization, PPC determines that these standards and/or one or more of these controls cannot be applied
046	Div. 10 - Sec. 013543	3.7.H.1	ENVIRONMENTAL PROCEDURES - Construction Noise Control Best Management Practices	When directed by the City Planning Department, Principal Project Company shall submit revisions to the approved construction noise- control plan for review and written approval if, in the sole determination of the City Planning Department, modified noise control minimization measures are not effective. In the event that arevisions to the construction noise- control plan isare required, Principal Project Company shall cease the use of equipment that is responsible for exceedances. Principal Project Company may resume the use of such equipment after the revised construction noise- control plan is approved and all its provisions are enacted.	Review/Comment	pertains to resubmittal if City determine,s in sole discretion, revisions to the noise control plan are necessary due to recorded execessive noise levels or repeated complaints.
047	Div. 10 - Sec. 013543	3.8.D	ENVIRONMENTAL PROCEDURES - Naturally Occurring Asbestos (NOA)	Before work in areas of NOA shown in the Design Documents which intersect with areas of roadway construction and maintenance which require the disturbance of soils by construction and grading, Principal Project Company shall submit the Bay Area Air Quality Management District's (BAAMQD) "Notification Form for Road Construction and Maintenance Operations" to BAAMQD fourteen business days in advance of land disturbance of soils containing NOA.	Information	Informational for City as submittal is to BAAQMD
048	Div. 10 - Sec. 013543	3.8.E.1.a	ENVIRONMENTAL PROCEDURES - Naturally Occurring Asbestos (NOA)	If NOA is unexpectedly encountered after the Project has started, Principal Project Company shall submit a notification to the BAAQMD no later than the next business day using the Asbestos Dust Mitigation Plan (ADMP) Discovery Notification Form found at the link below: https://www.baaqmd.gov/~/media/Files/Compliance%20and%20Enforcement/Asbestos/admp_discovery_application.ashx?la=en, and followed by email to the BAAQMD, and at the same time notify City with the project details.	Information	Informational for City as notification is to BAAQMD
049	Div. 10 - Sec. 013543	3.9.A.1	ENVIRONMENTAL PROCEDURES - Asbestos Dust Mitigation	Sixty days (60) days before commencement of grading, and excavation activities, Principal Project Company shall submit to the City an Asbestos Dust Mitigation Plan (ADMP) for review.	Review/Comment	

Potrero Yard - Technical Requirements
Exhibit 18, Division 10 - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Division and Section Reference	Subsection Reference	Contract Data Item Title / Description	Required Submission	Submittal Action (Proprietary)	Notes/Comments
050	Div. 10 - Sec. 013543	3.9.A.2	ENVIRONMENTAL PROCEDURES - Asbestos Dust Mitigation	Upon City's written approval, Principal Project Company shall submit the ADMP, the ADMP application, and the BAAQMD Regulation 3 Fees to the (Air Pollution Control Officer (APCO) for its review and approval. Principal Project Company shall furnish all information required by the BAAQMD to amend and finalize the ADMP. Principal Project Company shall not be reimbursed for the BAAQMD Regulation 3 Fees.	Review/Comment	APCO not spelled out in TRs
051	Div. 10 - Sec. 013543	3.9.A.5	ENVIRONMENTAL PROCEDURES - Asbestos Dust Mitigation	Principal Project Company, at no cost to the City, will perform perimeter air monitoring for asbestos at the project site during its soil disturbance activities for the duration of the project. This will be in accordance with the approved ADMP. All record keeping and reporting will be submitted to the BAAQMD on a weekly basis or as per a reporting schedule requested by BAAQMD.	Information	Informational for City as notification is to BAAQMD
052	Div. 10 - Sec. 013543	3.15.F.1	ENVIRONMENTAL PROCEDURES - Site Restoration	With regards to seeding for purposes of restoring the site, mixing shall be performed in the presence of Principal Project Company's QC Manager and City. Principal Project Company shall submit bags of materials used in the mix to City.	Review/Comment	
053	Div. 10 - Sec. 013543	3.18.A	ENVIRONMENTAL PROCEDURES - ARCHAEOLOGICAL RESOURCE PROTECTION	Prior to issuance of construction permits, Principal Project Company shall have an Archeological Monitoring Plan reviewed and approved by City Planning Department. Principal Project Company shall ensure compliance with the approved Archeological Monitoring Plan which shall govern for the associated construction activities as stated in the approved plan.	Information	Informational for City as approval is City Planning Department
054		3.18.A.1	ENVIRONMENTAL PROCEDURES - ARCHAEOLOGICAL RESOURCE PROTECTION	Following the distribution of the "ALERT" sheet, Principal Project Company shall provide City with a signed affidavit confirming that all field personnel have received copies of the "ALERT" sheet.	Review/Comment	
055	Div. 10 - Sec. 013543	3.20.C	ENVIRONMENTAL PROCEDURES - San Francisco Environment Code Clean Construction Requirements for Work in an Air PollutantExposure Zone (APEZ)	Principal Project Company shall submit a Construction Emissions Minimization Plan (CEMP) to the City Planning Department for review and written approval for compliance with Chapter 25 of the San Francisco Environment Code.	Information	redundant with 1.4.A.1.g above
056	Div. 10 - Sec. 013543	3.20.D	ENVIRONMENTAL PROCEDURES - San Francisco Environment Code Clean Construction Requirements for Work in an Air PollutantExposure Zone (APEZ)	Principal Project Company must submit a signed Clean Construction Emissions Plan Certification Statement to the City Planning Department. Refer to the following link for the Emissions Plan Certification Statement Template: https://www.sfdph.org/dph/EH/Air/CleanConstruction.asp.	Information	submittal part of CEMP process
057	Div. 10 - Sec. 013543	3.20.H	ENVIRONMENTAL PROCEDURES - San Francisco Environment Code Clean Construction Requirements for Work in an Air PollutantExposure Zone (APEZ)	Principal Project Company shall submit quarterly and biannual reports to the City Planning Department documenting compliance with the CEMP, and submit each report within seven business days of the end of each quarter.	Information	
058	Div. 10 - Sec. 013543	3.20.I	ENVIRONMENTAL PROCEDURES - San Francisco Environment Code Clean Construction Requirements for Work in an Air PollutantExposure Zone (APEZ)	Principal Project Company shall submit a final CEMP report within four weeks of achieving Substantial Completion summarizing compliance of construction activities with the CEMP, including the start and end dates and duration of each Construction Phase	Information	
059	Div. 10 - Sec. 013543	3.21.B	ENVIRONMENTAL PROCEDURES - CONSTRUCTION SITE RUNOFF CONTROL PERMIT	Principal Project Company shall submit the Construction Site Runoff Control Permit Application within (30) thirty calendar days after NTP 2 for review and approval by the City.	Review/Comment	
060	Div. 10 - Sec. 013543	3.21.D	ENVIRONMENTAL PROCEDURES - CONSTRUCTION SITE RUNOFF CONTROL PERMIT	Principal Project Company shall provide the SFPUC with a transmittal, with a copy to the City Planning Department, at least two working days before each these milestones to inform the SFPUC inspector that the following are about to occur: 1. Commencement of Construction Work. 2. Erosion and sediment control measures are completely installed and stabilized. 3. Final grading has been completed. 4. Substantial Completion.	Information	Informational for City as notfication is to SFPUC
061	Div. 10 - Sec. 013543	3.24.A.3	EMERGENCY OR BACKUP DIESEL GENERATOR HEALTH RISK REDUCTION PLAN	The Principal Project Company shall submit the plan to City Planning Department for review and approval prior to issuance of a permit for emergency diesel generators from the San Francisco Department of Building Inspection or the Bay Area Air Quality Management District.	Information	Informational for City as notfication is to SF Building Inspection or BAAQMD
062	Div. 10 - Sec. 013543	3.25.A	FIXED MECHANICAL EQUIPMENT NOISE CONTROL FOR BUILDING OPERATIONS	Prior to approval of a building permit, the Principal Project Company shall submit documentation to City Planning Department, demonstrating with reasonable certainty that the building's fixed mechanical equipment (such as heating, ventilation and air conditioning [HVAC] equipment):	Information	Informational for City as notfication is to City Planning Dept. There are 9 meaures follow this statement in the TRs
063	Div. 10 - Sec. 013543	Appendix B	COMPLETE ENVIRONMENTAL MITIGATION AND MONITORING PLAN	See all submittals contained therein.	Information	Principal Project Company is responsible for all submittal requirements in Division 10 Section 01 35 43 Appendix B: COMPLETE ENVIRONMENTAL MITIGATION AND MONITORING PLAN.

Potrero Yard - Technical Requirements
Exhibit 18, Division 10 - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Division and Section Reference	Subsection Reference	Contract Data Item Title / Description	Required Submission	Submittal Action (Proprietary)	Notes/Comments
064	Div. 10 - Sec. 013544	1.1.E	HAZARDOUS BUILDING MATERIALS - Summary - Environmenal	Principal Project Company shall submit to City as Regulator certifications or proof of the trainings, listed below, as a Submittal as per Section 02 80 13 Hazardous Building Materials Remediation. 1. Health and Safety training 2. HAZWOPER training 3. Cal/OSHA Competent Person training for the field supervisor overseeing activities that disturb asbestos, or naturally occurring asbestos (NOA) as per Title 8 CCR 1529. 4. Cal/OSHA asbestos training (for all trades who will come in contact and disturb asbestos or NOA. 5. Lead training (for all trades that will come in contact and disturb lead containing paints as per Cal/OSHA 1532.1 Lead in Construction standard) 6. Medical examination and blood tests (as warranted) 7. Respiratory protection (including current respirator fit test records) 8. Storm water pollution prevention awareness training to enable the Principal Project Company's personnel to comply with the Erosion and Sediment Control Plan. 9. Other training pertaining to the Work being conducted.	Information	
065	Div. 10 - Sec. 013544	1.4.A.1	HAZARDOUS BUILDING MATERIALS – Abatement Contractor's Qualifications	Principal Project Company shall ensure that any entity that performs the abatement Work submits to the City as Regulator current licenses and certifications for the specific type of abatement Work to be performed. Submits to the City as Regulator a letter confirming compliance with current Laws, as outlined in the specifications listed in the paragraph below.	Information	
066	Div. 10 - Sec. 013544	1.4.A.2	HAZARDOUS BUILDING MATERIALS – Abatement Contractor's Qualifications	Principal Project Company shall ensure that any entity that performs the abatement Work submits to City as Regulator copies of any notices regarding safety and environmental violations received from regulatory agencies in the last 20 years.	Information	
067	Div. 10 - Sec. 013544	1.4.B.1	HAZARDOUS BUILDING MATERIALS – Hazardous Material Management Plan (HMMP)	Before commencing any abatement Work, Principal Project Company shall submit to the City's Authorized Representative and City as Regulator a Hazardous Materials Management Plan (HMMP) in accordance to the requirements of this Section, and Section 02 80 13 Building Related Hazardous Materials Remediation.	Review/Comment	See 02 80 13 for additional Hazardous Materials and Hazardous Waste requirements.
068	Div. 10 - Sec. 013544	1.8.A	HAZARDOUS BUILDING MATERIALS – Waste Handling and Characterization	The Contractor shall submit to the City as Regulator a Waste Management Plan (WMP) as specified under Section 02 80 13 Building Related Hazardous Materials Remediation.	Information	
069	Div. 10 - Sec. 013544	1.8.D	HAZARDOUS BUILDING MATERIALS – Waste Handling and Characterization	Principal Project Company shall obtain and pay for all sampling and profiling analyses required for waste disposal. Principal Project Company shall ensure that California CDPH-accredited laboratories perform analyses. Principal Project Company shall submit results of such analyses to the City as Regulator prior to scheduling the waste off haul.	Information	
070	Div. 10 - Sec. 013544	1.8.P	HAZARDOUS BUILDING MATERIALS – Asbestos Waste Disposal	1.d. Principal Project Company shall provide, prepare and submit to the City's Authorized Representative and SAR group within City Public Works Department a Uniform Hazardous Waste Manifest Form for asbestos Hazardous Waste shipments.	Information	
071	Div. 10 - Sec. 013544	1.9.B	HAZARDOUS BUILDING MATERIALS – Non-hazardous manifest form	Principal Project Company shall submit each non-hazardous waste manifest form to the SAR group within City Public Works Department for the generator's signature at least 72 hours in advance of the day of the off-haul with an estimate of the number of loads scheduled for off-haul.	Information	
072	Div. 10 - Sec. 013544	1.9.D	HAZARDOUS BUILDING MATERIALS – Non-hazardous manifest form	Within 30 days of the off haul, Principal Project Company shall submit to the City's Authorized Representative and SAR group within City Public Works Department with copies of each completed non-hazardous waste manifest Form (with the landfills signature).	Information	
073	Div. 10 - Sec. 013545	1.3.A	HEALTH AND SAFETY CRITERIA - Submittals	Principal Project Company shall submit to the City the following Submittals no later than ten Days before start of Work at the Project Site or NTP2, whichever is earlier. 1. Site-specific Health and Safety Plan (HASP) prepared, signed and stamped by a Certified Industrial Hygienist (CIH) prepared in accordance with the requirements contained in this Section 01 35 45, CFR Title 29, CCR Title 8 and other applicable regulations, which shall cover all aspects and scope of Work. 2. Principal Project Company's Injury and Illness Prevention Programs (IIPP) and Code of Safe Practices (CSP), in accordance with with the requirements contained in this Section 01 35 45 and the California Code of Regulations (CCR), Title 8. 3. Templates for all safety forms and reports 4. Completed Activity Hazard Analysis (AHA) or Job Hazard Analysis (JHA) submitted with the HASP using the AHA/JHA template for all significant activities and tasks with a highrisk potential, describing the job steps, hazards associated with each job step, and the controls used to remove or minimize the associated hazards 5. SDS (Safety Data Sheet) for all chemicals and other hazardous materials used in the Work. 6. If Serpentine is present Principal Project Company shall have Cal/OSHA 40-hour asbestos training for the competent person overseeing Serpentine/ Naturally Occurring Asbestos (NOA) disturbance activities and managing personal air monitoring for asbestos.	Information	
074	Div. 10 - Sec. 013545	1.3.B	HEALTH AND SAFETY CRITERIA - Experience Statement	Principal Project Company shall submit to the City no later than 10 days prior to the start of construction Work the qualifications and experience of the it's Project Safety Representative (PSR) as specified in this Section 01 35 45 – Health and Safety Criteria.	Review/Comment	
075	Div. 10 - Sec. 013545	1.5.H	HEALTH AND SAFETY CRITERIA - Health and Safety Plan	Furnish copies of all records of all health and safety audits, inspections, and reviews [48 hours after the audit, inspection or review.]	Information	
076	Div. 10 - Sec. 013545	1.13.E	HEALTH AND SAFETY CRITERIA - Personal Protective Equipment (PPE)	Where "Hot Work" is involved, a Hot Work permit must be submitted to the City as Regulator prior to commencing that Work.	Information	
077	Div. 10 - Sec. 013545	1.19.B	HEALTH AND SAFETY CRITERIA - Logs, Reports, and Recordkeeping	Principal Project Company shall submit Monthly project safety statistics, which shall include Project safety inspections, hours worked by Principal Project Company, OSHA Recordable Incidents, Incident Rates, Lost Work Day Cases, Total Project Lost Work Days, Days Away from Work Rate, First Aid Cases, and Property Damage Incidents, to City as part of the Monthly Progress Status Report.	Information	

Potrero Yard - Technical Requirements
Exhibit 18, Division 10 - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Division and Section Reference	Subsection Reference	Contract Data Item Title / Description	Required Submission	Submittal Action (Proprietary)	Notes/Comments
078	Div. 10 - Sec. 013545	1.21.F	HEALTH AND SAFETY CRITERIA - Incident Reporting	Principal Project Company shall submit to the City a Preliminary Incident/Near Miss Investigation Report (PIR) within 24 hours of the incident or near miss. Principal Project Company shall submit a Final Incident/Near Miss Investigation Report (FIR) as soon as possible (generally within 48 hours) after incident or near miss. Principal Project Company shall not perform Work in the area or of a type that poses risks similar to those of the incident or near miss until a Corrective Action Report (CAR) is complete and submitted to the City.	Information	Applies if/when an incident and near miss incident ("near miss") occurs
079	Div. 10 - Sec. 013545	1.23.B	HEALTH AND SAFETY CRITERIA - Project Safety Representative	If the City observes an unsafe Project Site condition or unsafe means or methods of performing Work, the City will inform Principal Project Company's Construction Manager or PSR, who shall take whatever actions Principal Project Company deems necessary to immediately remedy the unsafe Project Site condition or unsafe work practice, or unsafe means or methods in which the Work is performed. Principal Project Company shall within 24 hours of taking such remedial action submit a report to the [City 's Authorized Representative] describing the unsafe Project Site condition or work practice, and how Principal Project Company remedied that unsafe condition, unsafe work practice, or unsafe means and methods of performing the Work.	Information	NTD: [City 's Authorized Representative] says Engineer in drafting currently. Needs correction.
080	Div. 10 - Sec. 013550	2.1.A	ADDITIONAL ENVIRONMENTAL PROCEDURES - Documentation of Historical Resource	Principal Project Company shall submit to the City Planning Department for approval the scope of the documentation which shall include the following elements: 1. Measured Drawings 2. HABS/HALS-Level Photographs: 3. HABS/HALS Historical Report 4. Video Recordation 5. Softcover Book	Information	Informational cit City as review role is City Planning Dept. Each measure 1-5 has detailed requirements in TRs
081	Div. 10 - Sec. 013550	2.2.A	ADDITIONAL ENVIRONMENTAL PROCEDURES - Salvage Plan	Prior to any demolition that would remove character-defining features, Principal Project Company shall consult with the Planning Department as to whether any character-defining features that are proposed to be demolished may be salvaged, in whole or in part, during demolition.	Information	If required by City Planning Department. See 02 41 16 for Demolition Plan requirements.
082	Div. 10 - Sec. 013550	2.3.A	ADDITIONAL ENVIRONMENTAL PROCEDURES - Interpretation of the Historical Resource	Principal Project Company shall submit to the City Planning Department for approval an interpretive program plan prepared by a qualified consultant.	Information	
083	Div. 10 - Sec. 013550	2.4.A	ADDITIONAL ENVIRONMENTAL PROCEDURES - Oral Histories	Principal Project Company shall undertake an oral history project on the resource, understaken by a professional historian in conformance with the Oral History Association's Principles and Best Practices (https://www.oralhistory.org/principles-and-bestpractices-revised-2018/), and shall submit the completed oral history project to the San Francisco Public Library, Planning Department, and other interested historical institutions. The oral history project shall also be incorporated into the interpretative program (see Article 1.6).	Information	NTD: Article 1.6 reference is not correct.
084	Div. 10 - Sec. 013550	2.6.A	ADDITIONAL ENVIRONMENTAL PROCEDURES - Construction Management Plan	Principal Project Company shall submit to the City Planning Department the Construction Management Plan that shall include additional measures to further minimize disruptions to people walking and bicycling, transit, and emergency vehicles during construction. Additional measures include: 1. encourage carpooling, bicycle, walk, and transit access to the Project Site by construction workers 2. provide nearby residences and adjacent businesses with regularly updated information regarding project construction, including email notices distributed by PPC	Information	This CMP should be the same CMP as required by Division 1, but meeting the requirements in this Section for purposes of City Planning Department review
085	Div. 10 - Sec. 013550	2.7.A	ADDITIONAL ENVIRONMENTAL PROCEDURES - Driveway and Loading Operations Plan (DLOP)	Principal Project Company to submit a Driveway and Loading Operations Plan (DLOP) to the City Planning Department for approval. The intent of the DLOP is to reduce potential conflicts between passenger and freight loading and transit operations, and between passenger and freight loading activities and people walking and bicycling, and other vehicles in the project vicinity, as well as to maximize reliance on onsite facilities to accommodate freight loading demand.	Information	
086	Div. 10 - Sec. 013550	2.8.A	ADDITIONAL ENVIRONMENTAL PROCEDURES - Preconstruction Paleontological Evaluation and Monitoring Plan During Construction	Principal Project Company shall submit the Preconstruction Paleontological Monitoring Plan to the City Planning Department for approval.	Information	See 01 35 50, Section 3.2.A requirements
087	Div. 10 - Sec. 013550	3.2.A	ADDITIONAL ENVIRONMENTAL PROCEDURES - Paleontological Monitoring During Construction	Principal Project Company shall submit a final monitoring report and any data recovery report to the City Planning Department for approval prior to the certificate of occupancy.	Information	
088	Div. 10 - Sec. 013550	3.3.C&F-I	ADDITIONAL ENVIRONMENTAL PROCEDURES - Inadvertent Discovery of Paleontological Resources	C. Principal Project Company shall submit a Paleontological Resources worker awareness training form/affidavit to the City Planning Department within five (5) business days of conducting the training. F. If the qualified paleontologist determines that the discovery is not scientifically important, the qualified paleontologist shall document this conclusion in a Paleontological Evaluation Letter to demonstrate compliance with applicable statutory requirements (e.g., Federal Antiquities Act of 1906, CEQA Guidelines Section 15064.5, California Public Resources Code Chapter 17, Section 5097.5, Paleontological Resources Preservation Act 2009). Principal Project Company shall submit the Paleontological Evaluation Letter to the City Planning Department for review within 30 calendar days of the discovery. G. If the qualified paleontologist determines that the discovery is of scientific importance, and there are no feasible measures to avoid disturbing this paleontological resource, the qualified paleontologist shall prepare and submit to the City Planning Department for approval a Paleontological Mitigation Program. H. If a Paleontological Mitigation Program is required, Principal Project Company shall prepare and submit a Paleontological Resources Report to the City Planning Department for review within 30 calendar days from consultation of the ground disturbing activities, or as negotiated with the City Planning Department. I. The paleontology report shall be submitted to City Planning Department for review within 30 business days from conclusion of ground disturbing activities, or as negotiated following consultation with City Planning Department.	Information	Applies only in the event of the discovery of an unanticipated paleontological resource during construction.
089	Div. 10 - Sec. 015000	1.13.D	TEMPORARY FACILITIES AND CONTROLS - Sign	Principal Project Company shall submit a mock-up of the Project sign in color, on bond paper, 11x17 size, to the City for approval prior to fabrication.	Information	

Potrero Yard - Technical Requirements
Exhibit 18, Division 10 - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Division and Section Reference	Subsection Reference	Contract Data Item Title / Description	Required Submission	Submittal Action (Proprietary)	Notes/Comments
090	Div. 10 - Sec. 017450	1.4.G	MATERIAL REDUCTION AND RECOVERY PLAN - Demolition Debris Recovery Plan (DDRP)	Principal Project Company conducting full demolition of an existing structure must submit a Demolition Debris Recovery Plan (DDRP) to the San Francisco Environment Department (SFED). The DDRP must be submitted to and approved by SFE before the Department of Building Inspection will issue a Full Demolition Permit.	Information	
091	Div. 10 - Sec. 017450	1.5	MATERIAL REDUCTION AND RECOVERY PLAN - Material Reduction and Recovery Plan (MRRP)	Develop and submit a project specific MRRP for the Project through the Green Halo waste tracking program. The City will create a Green Halo project account for use by Principal Project Company.	Information	
092	Div. 10 - Sec. 024116	1.6	STRUCTURE DEMOLITION - Informational Submittals	Principal Project Company shall submit a number of informational submittals in addition to the Demolition Plan.	Information	
093	Div. 10 - Sec. 024116	1.7	STRUCTURE DEMOLITION - Demolition Plan	The Principal Project Company shall submit a complete Demolition Plan detailing procedures and sequence for removing the existing structures including all features necessary to remove the structure in a safe and controlled manner to insure stability of the structure at any given time.	Information	
094	Div. 10 - Sec. 028013	1.5.A	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	Principal Project Company shall submit copies of any notice of safety and environmental violations received from the regulatory agencies that they may have received in the last 20 years in the USA.	Information	
095	Div. 10 - Sec. 028013	1.5.B	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	Principal Project Company shall submit copies all the Minimum Qualification licensing requirements asked for in Section 01 35 44 Hazardous Building Materials Scope of Work.	Information	
096	Div. 10 - Sec. 028013	1.5.C	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	Principal Project Company shall submit proof of its five (5) years of hazardous materials abatement and/or removal experience asked for in Section 01 35 44 Hazardous Building Materials Scope of Work.	Information	NTD: need to correct "…or its Hazardous Materials abatement Principal Project Company…"
097	Div. 10 - Sec. 028013	1.5.D	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	Principal Project Company shall submit proof of its environmental training requirements asked for in Section 01 35 44 Hazardous Building Materials Scope of Work.	Information	
098	Div. 10 - Sec. 028013	1.5.E	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	For all demolition of buildings and structures, regardless of whether asbestos is present or not, Principal Project Company shall submit a copy of the BAAQMD-issued Approval Letter for Asbestos for Demolition, "[Job Number]" to the City's Authorized Representative prior to the start of Demolition. To obtain this letter, Principal Project Company shall submit an Asbestos Demolition Notification to the BAAQMD through their web-based Online Asbestos Notification System (http://learn.baaqmd.gov/course/view.php?id=4#section-5) at least ten (10) business days prior to the start of any demolition.	Information	
099	Div. 10 - Sec. 028013	1.5.F	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	As per Section 01 35 44 Hazardous Building Materials - Scope of Work, Principal Project Company shall submit a Hazardous Materials Management Plan (HMMP) with the following documentation listed below. The HMMP shall be submitted no later than ten Days before start of Work at the Project Site or NTP2, whichever is earlier and before commencement of demolition activities. No hazardous materials work may start without the HMMP reviewed and approved by the City.	Review/Comment	See Section 1.5, items J, K and L for specialty HMMP submittal requirements pertaining to lead-related Work, Copper Chromate Arsenate (CCA) treated wood related Work, and fluorescent light tube related Work, if applicable.
100	Div. 10 - Sec. 028013	1.5.H	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	As part of Principal Project Company's HMMP, Principal Project Company shall submit a Waste Management Plan (WMP). The WMP is Principal Project Company's comprehensive plan for waste management of hazardous and non-hazardous waste generated during the remediation work of this project.	Information	
101	Div. 10 - Sec. 028013	1.5.I	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	For Asbestos Containing Construction Materials (ACCM), or Asbestos Containing Material (ACM), as applicable by regulation, and as part of the Hazardous Materials Management Plan (HMMP) Principal Project Company shall submit a number of items (see drafting) for: 1. Pre-job Submittals 2. Periodic Submittals 3. Close-out Submittals	Information	
102	Div. 10 - Sec. 028013	1.5.J	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	For Lead - Related Work, and as part of the Hazardous Materials Management Plan (HMMP) Principal Project Company shall submit a number of items (see drafting).	Information	
103	Div. 10 - Sec. 028013	1.5.K	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	For Copper Chromate Arsenate (CCA) treated wood related Work, as part of the Hazardous Materials Management Plan (HMMP), Principal Project Company shall submit the a number of items (see drafting).	Information	
104	Div. 10 - Sec. 028013	1.5.L	HAZARDOUS BUILDING MATERIALS - REMEDIATION - Submittals	For fluorescent light tube related Work, as part of the Hazardous Materials Management Plan (HMMP), Principal Project Company shall submit the a number of items (see drafting).	Information	
105	Div. 10 - Sec. 028013	3.3.F	Hazardous Building Materials Remedation - ASBESTOS ABATEMENT PREPARATION	1.c. (1) Establish a pressure differential of -0.025 inches w.g. with manometer reading records. Submit manometer readings daily or upon request.	Information	NTD: In drafting not clear who submittal needs to go to.
106	Div. 10 - Sec. 028013	3.5.C (1-2)	Hazardous Building Materials Remedation - HAZARDOUS MATERIALS REMOVAL PROCEDURES	1. Mastic removal solvents, procedures, and equipment information submittals must be approved prior to floor coverings removal. 2. In flooring areas where a solvent-based mastic remover is to be applied, Principal Project Company shall use a low odor mastic remover. Principal Project Company shall submit the Safety Data Sheets (SDS) of the mastic remover it intends to use, for the review and approval of the oversight Consultant.	Information	
107	Div. 10 - Sec. 028013	3.5.T	Hazardous Building Materials Remedation - HAZARDOUS MATERIALS REMOVAL PROCEDURES	1. Where mechanical removal of surface coatings constitutes a Level II activity, provide power tools, to the extent feasible, with local HEPA exhaust or dust collector systems to capture the aerosolized lead. Principal Project Company shall submit, as part of the HMMP, a detailed work plan for any of the following activities: a. Removal with power blasting tools b. Removal with power washing c. Removal with Sodium Bicarbonate Blasting.	Information	

Potrero Yard - Technical Requirements
Exhibit 18, Division 10 - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Division and Section Reference	Subsection Reference	Contract Data Item Title / Description	Required Submission	Submittal Action (Proprietary)	Notes/Comments
108	Div. 10 - Sec. 028110	1.3	ENVIRONMENTAL MANAGEMENT OF EXCAVATED MATERIALS - Submittals	A. The Contractor shall submit the required documents no later than ten Days before start of Work at the Project Site or NTP2, whichever is earlier, before any soil disturbing activity may begin. B. See drafting for detailed list of required submittals.	Information	
109	Div. 10 - Sec. 028110	1.4.B	ENVIRONMENTAL MANAGEMENT OF EXCAVATED MATERIALS - Pre-excavation Environmental Soil Profiling (Phase II Environmental Site Assessment)	If Principal Project Company seeks an exemption from the list of as needed environmental consultants, submit the name and qualifications of an environmental consultant that has done work in compliance with Article 21 of the City's Health Code (Maher Ordinance) for the City's approval.	Information	Applicable only for Phase II ESA work.
110	Div. 10 - Sec. 028110	1.4.E,N,O	ENVIRONMENTAL MANAGEMENT OF EXCAVATED MATERIALS - Pre-excavation Environmental Soil Profiling (Phase II Environmental Site Assessment)	E. Principal Project Company shall submit a Pre-Excavation Soil Profiling Sampling Plan for review and approval by both the City and San Francisco Department of Public Health prior to any drilling. N.2. Tabulate the testing results from the laboratory and submit it to the City. N.4. Prepare a draft and final report of this Environmental Site Assessment (Phase II) that is signed and stamped by both the principal and a registered professional engineer or geologist. O. Forward a digital copy of the draft environmental report for the City's review. After which, forward the final environmental report at least 5 days prior to excavation work. This report shall be prepared, stamped, and signed by a California licensed professional geologist or professional civil engineer.	Information	
111	Div. 10 - Sec. 028110	1.10.A	ENVIRONMENTAL MANAGEMENT OF EXCAVATED MATERIALS - Use of Non-Hazardous Waste Manifest for Class II Material or Lesser	For transportation and disposal of the non-Hazardous Waste, Principal Project Company shall initiate and fill out a non-Hazardous Waste profile form with the Class II/III landfill of its choosing. Then, submit this waste profile form to the City for its approval & signature. Next, Principal Project Company shall prepare a non-hazardous waste manifest form from the landfill. The non-hazardous waste manifest form shall be completed for each vehicle carrying excavated material classified as California Class II and Class III designated waste, or of a lesser waste classification. Principal Project Company shall submit the non-hazardous waste manifest form to the City for the Generator's signature at least 72 hours in advance of the day of the off-haul with an estimate of the number of loads scheduled for off-haul. See drafting for manifest form requirements.	Review/Comment	
112	Div. 10 - Sec. 028110	1.11.D,E,I	ENVIRONMENTAL MANAGEMENT OF EXCAVATED MATERIALS - Use of Non-Hazardous Waste Manifest for Class II Material or Lesser	D.1. For transportation and disposal of the Hazardous Waste, Principal Project Company shall initiate and fill out a Hazardous Waste profile form with the Class I landfill of its choosing. Then, it shall submit this Hazardous Waste profile form to the City for its approval and signature. Next, Principal Project Company shall provide and prepare the Hazardous Waste manifest for each shipment of Hazardous Wastes from the Project Site. E. Principal Project Company shall notify the City 72 hours prior to off-haul of all excavated material. If the manifest and other forms above are to be signed by the City during periods other than the hours stipulated above, Principal Project Company shall give an additional 72-hour advance notice to the City. I. Within 2 days of its return, Principal Project Company shall provide the City with the completed waste manifest. The completed waste manifest shall be certified by the receiver of the waste shipment, confirming that the shipment was received at the waste treatment or disposal facility designated in Principal Project Company's bid, and certifying the weight of the shipment.	Review/Comment	
113	Div. 10 - Sec. 028110	1.12.E,F	ENVIRONMENTAL MANAGEMENT OF EXCAVATED MATERIALS - Underground Storage Tank (UST) Closure Plan	E. Principal Project Company shall prepare an Underground Storage Tank (UST) Closure Plan in compliance with Article 21 of the San Francisco Health Code, if UST's will be removed. Principal Project Company shall only remove the underground tanks, pipes, and related appurtenances only in the presence of an inspector from the City's Department of Public Health, the City's Fire Department, and the City's Representative. F. Principal Project Company shall furnish documentation of the removal of an underground tank.	Information	
114	Div. 10 - Sec. 028110	3.2.B	ENVIRONMENTAL MANAGEMENT OF EXCAVATED MATERIALS - Reuse of Excavated Soils as Backfill	2. Native soils must meet sieve and chloride requirements. Principal Project Company shall submit sample results to the City prior to placement.	Information	
115	Div. 10 - Sec. 028110	3.3.A,B	ENVIRONMENTAL MANAGEMENT OF EXCAVATED MATERIALS - Reuse and Recycling of Excavated Soils at Other Facilities	A.3. Submit a letter of acceptance from the receiving facility or project. The letter shall indicate the volumes of soils accepted. Submit a value engineering calculation demonstrating cost savings to the City. Any savings that result from such reuse or recycle work will be a spilt 50/50 between [the City and Principal Project Company]. B.2. Submit a copy of the letter of acceptance and all records, including the financial statements for the value engineering saving prior to the approval of the reuse or recycling of these soils.	Information	
116	Div. 10 - Sec. 028110	3.4.C,D,R	ENVIRONMENTAL MANAGEMENT OF EXCAVATED MATERIALS - Import Fill	C. In advance of hauling in and use of import soil (fill) Principal Project Company for each source of import soil (fill), shall provide the City the original source of where the import soil (fill) is coming from, the name of the laboratory used to analyze the soils, and the date of chemical analysis. Laboratory results shall not be over 6 months old. D. Principal Project Company shall provide chemical analytical results for each source and of the same soil classification type (based on the unified soil classification system) of import soil (fill) in accordance with the Recommended Fill Material Sampling Schedule stated in the Department of Toxic Substances Control (DTSC) Advisory Note for Clean Imported Material. R. Import soil (fill) shall not be brought on-site, prior to the City's approval of the analytical results. Analytical results submitted shall be referenced on the import fill spreadsheet submittal.	Information	

Potrero Yard - Technical Requirements

Exhibit 12 Energy Management - Initial List of Submittals

Date of update: 15-Nov-24

ID Number	Division Page #	Section Reference	Contract Data Item Title / Description	Required Submission Timing	City Submittal Action	Notes/Comments
001	2	3.2	Energy Analysis Report	Annually (60 days following end of each Contract Year)	Review/Accept	
002	4	3.8	Monthly Energy Report	Monthly	Review/Accept	
003	4	4.1.1	Energy Performance Action Plan	As per Section 4.1.1, as needed and 30 days after acceptance of the Energy Analysis Report	Review/Accept	

Division 2: Design Guidelines

A New Potrero Yard:

The San Francisco Municipal Transportation Agency Potrero Yard Modernization Project

Design Guidelines

Contents

1 Introduction

1.1 Background

The Potrero Yard Modernization Project's primary objective is to replace the obsolete Potrero Yard— which was originally built in 1915 as a streetcar facility—with a single integrated Facility that includes a Bus Yard Component, a Housing and Commercial Component, and Common Infrastructure and has an exceptional building and streetscape design.[1]

The San Francisco Municipal Transportation Agency (SFMTA) has been coordinating with the San Francisco Planning Department (SF Planning) and other City agencies since 2016 on preliminary work for the Project and has undertaken a robust stakeholder engagement program to receive and incorporate feedback.

These Design Guidelines provide the architectural and urban design principles and standards to guide the development of the Facility. The Project's Technical Requirements including these Design Guidelines are based on the work completed to date and should be used to develop the Project design.

These Design Guidelines convey general policies and urban design principles to which the Project should adhere. The guidelines help establish a common understanding of design principles and standards, but are not intended to dictate solutions to these principles and standards. Instead,they define a range of appropriate responses to a variety of specific design issues. Where the Design Guidelines state "shall", the PPC must interpret this language as a prescriptive design requirement. Where the Design Guidelines state "should," the City is promoting specific urban design principles and an encouraged urban design approach.

The following pages include examples and illustrations. These are included to illustrate concepts described; they are not intended to suggest a specific design solution or aesthetic.

1 See Division 01 of the Technical Requirements

1.2 Project Site and Context

The Project Site, located at 2500 Mariposa Street in San Francisco, is owned by the City and County of San Francisco under the jurisdiction of the SFMTA. The approximately 4.4-acre property is bound by Bryant, 17th, Hampshire, and Mariposa Streets.

The site is located in the northeastern quadrant of the Mission District, an area that includes mixed-use zones and has a variety of light industrial uses as well as residential, retail, office, and other uses. York Street terminates at Mariposa Street on the south side of the site. Franklin Square, a city neighborhood park, is located across 17th Street on the north side of the site.

The existing bus yard and Mariposa Street are relatively flat, while the surrounding terrain slopes up to the northeast. The sidewalk at the northeast corner of the Site at 17th and Hampshire Streets is approximately 22 feet higher than the sidewalk at southwest corner of the site at Mariposa and Bryant Streets.[2]

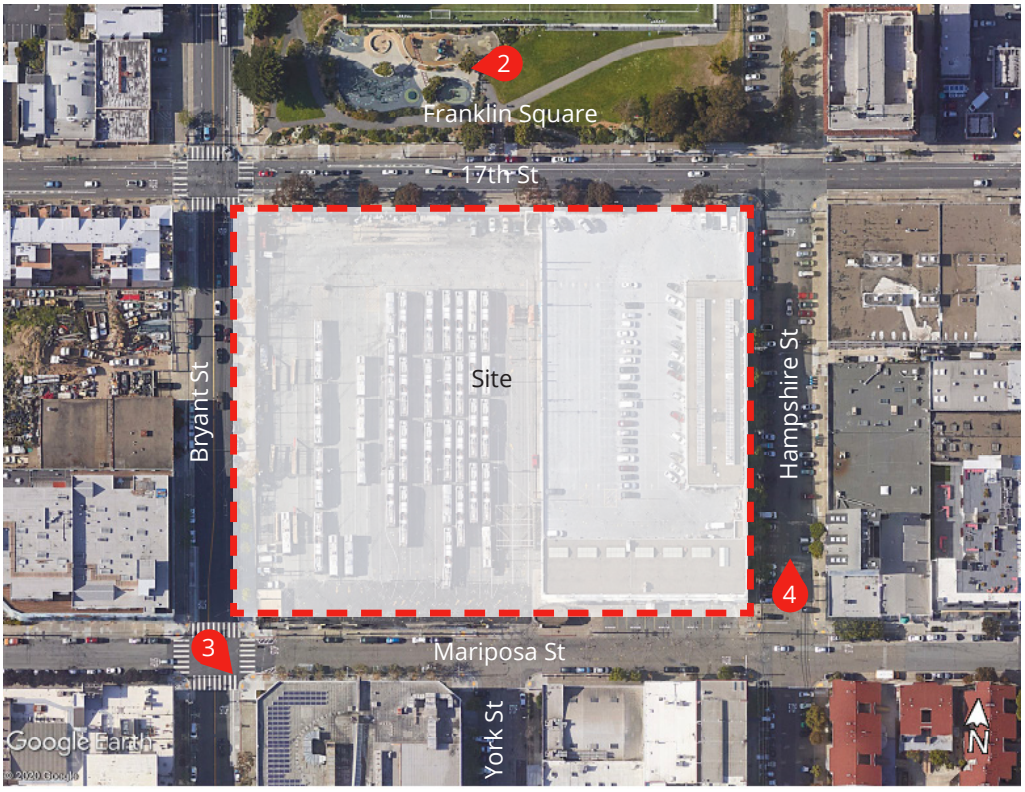


Figure 1. Site Aerial Photograph. Numbered keys refer to Figures on the following page.

2 See Division 01 of the Technical Requirements

1.3 Zoning and CEQA

In 2024 the San Francisco Board of Supervisors adopted an ordinance designating the Project Site as the Potrero Yard Special Use District (SUD) and approving the Project's Final Environmental Impact Report (FEIR).

The Project shall comply with the SUD, the FEIR and the associated Project's Conditional Use Authorization and other City and County of San Francisco ordinances and regulations.

Figure 2. Franklin Square looking west.

Figure 3. Intersection of Bryant and Mariposa Streets looking southeast at KQED facility. Rendering by EHDD Architects.

Figure 4. Hampshire Street looking north.

2 Overall Design Guidelines

"Good urban design is characterized by the thoughtful orchestration of buildings, landscape, open space, and streets … San Francisco's architecture spans various eras and architectural styles, but its urban fabric maintains a high degree of continuity and consistency … [N]ew buildings have the responsibility to sensitively respond to their context and existing patterns of development while being of their moment." [3]

2.1 Vision

The SFMTA is committed to its mission to "connect San Francisco through a safe, equitable, and sustainable transportation system." [4] The Project demonstrates the SFMTA's commitment to providing zero-emission public transit, a safe and modern work environment for the SFMTA employees, and a new development with an exceptional building and streetscape design that enhances the Mission and Potrero neighborhoods.

The proposed Project vision should describe a single integrated Facility that incorporates the bus facility, residential and commercial uses, and infrastructure in a manner that makes it a great place for the building's occupants and bus yard operations, and a great asset for the community.

The vision should:

- Celebrate the bus yard as the Site's core use.
- Support a design that reflects the unique combination of bus, residential, and commercial uses and integrates them into a building that is contextual to its highly mixed-use neighborhood.
- Foster the placemaking and community-oriented activities in the building and streetscape design.

3 San Francisco Planning, Urban Design Guidelines, March 22, 2018, p 4.

4 https://www.sfmta.com/reports/sfmta-strategic-plan-2021-2024, accessed 09/08/2023

2.2 Design

The concept should be clear, and the design compelling and implemented with care and consistency.

The design should:

- Achieve the Project Objectives and fulfill the Project vision.[5]
- Enhance the skyline and surrounding context with a building massing, that although larger and taller than surrounding buildings provides visual interest, an architectural character that relates to surrounding neighborhood, and active building facades that have a pedestrian orientation that engages the community.
- Comply with the Project's Conditional Use Authorization including its special restrictions as well as the Project's Technical Requirements including these Design Guidelines.

5. See Division 01 of the Technical Requirements

3 Building Design Guidelines

3.1 Uses and Building Organization

The new Potrero Yard is planned to include the bus yard, residential, and possibly commercial uses such as retail and community serving storefront uses. The bus yard will occupy most of the building below 75 feet in height while the commercial uses may occupy select areas of the ground floor and the residential uses will occupy select areas of the building below 75 feet in height and above the bus yard.

The Facility shall be designed to optimize modern and efficient bus operations in accordance with the Division 3 - Design Criteria Document and to incorporate residential and commercial uses and infrastructure into a cohesive building design. Each component shall be designed to meet its programmatic and other requirements and to function independently while being part of a harmonious building design.

For efficiency, identity, and wayfinding the bus, residential, and commercial uses should be organized in a simple and clear manner and should be easily distinguished from one another. For pedestrian safety, the residential entrances and commercial storefronts should be separated to the extent feasible from the bus entrances and exits.

To contribute to the urban context and complement surrounding uses, active ground-floor uses such as retail and community serving storefront uses are desired on Bryant and 17th Streets.

To optimize bus operations, incorporate residential and commercial uses, and enhance the urban context provide at a minimum:

- Bus and loading entrances and exits on Mariposa Street.
- At least one primary residential entrance and active ground-floor uses on Bryant Street.
- Active ground-floor uses on 17th Street.
- At least one primary residential entrance on Hampshire Street.

3.2 Height, Bulk, and Open Space[6]

Consider how the building's massing is perceived from distant views such as from Dolores Park, Corona Heights, and Potrero Hill as well as from the close-in, street-level perspective of the surrounding neighborhood. Develop a clear design concept with a massing that provides visual interest, breaks down the building's height and bulk, and minimizes shadows on Franklin Square.

Figure 5. Different volumes breakdown building scale. Example: Five88, San Francisco, CA.

Figure 6. Different volumes breakdown building scale. Example: Avalon Hayes, San Francisco, CA.

Figure 7. Expressed stair and perforated metal facade provides visual interest. Example: Center Street Parking Garage, Berkeley, CA.

6 Building heights (the vertical distance by which a building rises above a point) shall be measured from the midpoint of the Mariposa Street as described in the SUD.

The building shall not exceed 150 feet in height.

The—up to 75 feet tall—bus yard may be built to the property line but it should not appear monolithic. Reduce the scale of this mass by breaking it down into several volumes with plane changes and recesses while avoiding inactive or hidden spaces. Consider using an entrance alcove or plaza centered on the York Street axis to modulate the Mariposa Street facade and respond to the end of York Street.

The building above 75 feet in height shall step back from the property line and the overall massing shall step down from the south (Mariposa Street) side to north (17th Street) side. The building above 75 feet in height shall step back 10 to 20 feet on the south, west, and east frontages and 60 to 70 feet on the north frontage as described in the SUD to provide visual relief and mitigate shadows cast on Franklin Square.

The building above 75 feet in height shall vary in height and layout to provide visual interest and reduce the apparent building mass. The building above 115 feet in height shall have separate masses as described in the SUD. Consider locating these masses asymmetrically on the southern portion of the Site clear of the York Street right of-way axis.

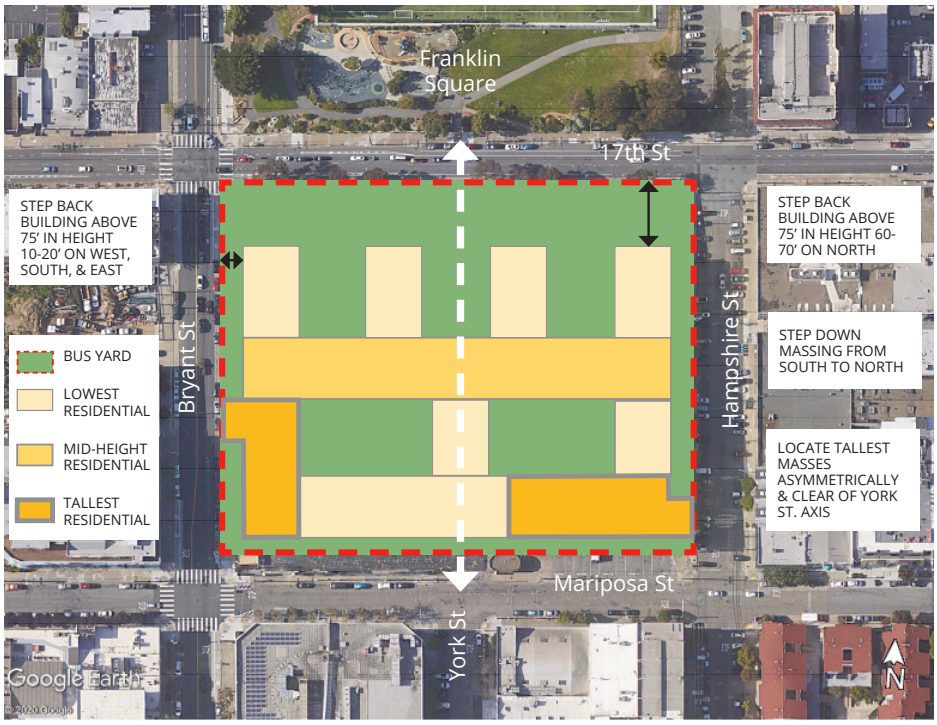


Figure 8. Diagram, which is based on the Reference Concept, illustrates the bulk requirements.

Use open spaces to modulate the building massing and use the building massing to shape open spaces that optimize solar exposure and protection from prevailing winds.

Open spaces, including those on the roof of the bus yard, should be attractive spaces for enjoying the outdoors, gathering, and recreation.

Provide separate open space areas that are easily accessible by the SFMTA employees and housing residents.

Open spaces should be visible and well illuminated with no hidden corners and should have seating and other elements, including a children's play area to enliven them. Locate seating in sunlit and shaded areas that are protected from wind.

Integrate landscape and stormwater management into the open space design. Support water and local biodiversity conservation by using San Francisco Bay Area native plant species and consider creating a pollinator habitat.

Figure 9. Housing podium open space with mix of seating areas. Example: Dr George W. Senior Residence & Senior Center, San Francisco, CA.

Figure 10. Open space with mix of private and shared spaces. Example: Avalon Dogpatch, San Francisco, CA.

Figure 11. Open space with mix of seating areas and landscaping. Example: Family House, San Francisco, CA.

3.3 Wall and Roof Treatment

The overall design should be a unified and cohesive composition that has a hierarchy and rhythm of architectural elements that have a pedestrian scale, provide visual interest, and are compatible with the surrounding context.

The design shall not have long expanses of flat, undifferentiated, or blank walls. Articulate the overall building massing into separate volumes and modulate these volumes with different materials and features such as recesses, bay windows, balconies, cornices, etc. The building articulation shall not rely on the use of surface applied elements, but use volumetric massing to create a hierarchy and rhythm that has a richness suitable to the surrounding neighborhood.

Differentiate bus, residential, and commercial components within the overall composition by the use of different materials, opening patterns, and/or features. Materials should be durable with an integral color such as concrete, masonry, glass, or factory finished metals.

Integrate wind mitigation measures into to the overall design.

The color scheme should be unified and enduring, but not bland. For example the bus yard accents could use the SFMTA and Muni color palette and the residential accents could reflect the Mission neighborhood's rich and varied color palette.

Design all facades and roofs with care and consistency. Consider approaches, such as views into the bus yard and public art installations, to supplement active ground-floor uses and provide visual interest on all four facades, including the Hampshire Street facade.

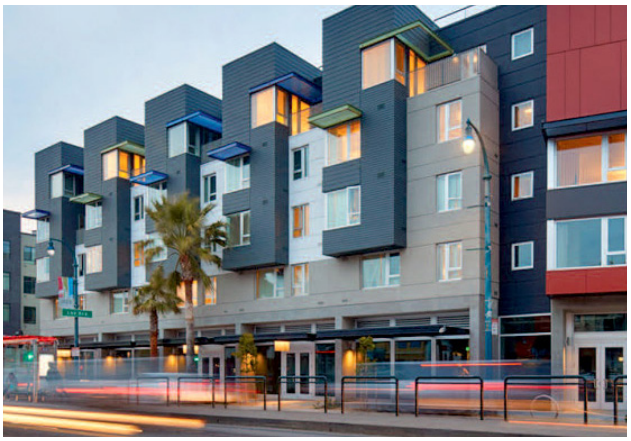


Figure 12. Unified composition with hierarchy and rhythm of architectural elements. Example: 1100 Ocean Avenue, San Francisco, CA.

Figure 13. Variations of materials and planes provides visual interest. Example: Drs. Julian + Raye Richardson Apartments, San Francisco, CA.

Figure 14. Bay window tile color derived from local color accents. Example: La Fenix at 1950 Mission, San Francisco, CA.

Also consider ways to treat the building corners, especially the corners on Bryant Street. For example a commercial use at the development's northwest corner at Bryant and 17th Streets could activate this location and link active uses on Bryant and Mariposa Streets.

Provide intentional facade terminations at the bus and the residential roof lines and use these to reinforce the building massing and design intent. Use bus yard facade terminations to help define the predominant streetwalls.

The Project roofs will be visible from near and far vantage points and should be considered the "fifth facade". Both occupied open spaces and unoccupied roofs should be designed with care. Consolidate rooftop equipment in fully screened areas and integrate these into the overall design.

Figure 15. Stacking elements creates a rhythm and glazed ground floor engaging entry. Example: 1601 Mariposa St., San Francisco, CA.

Figure 16. Mix of rich materials and elements creates visual interest and configuration a strong indoor-outdoor connection. Example: Five88 Mission Bay Blvd., San Francisco, CA.

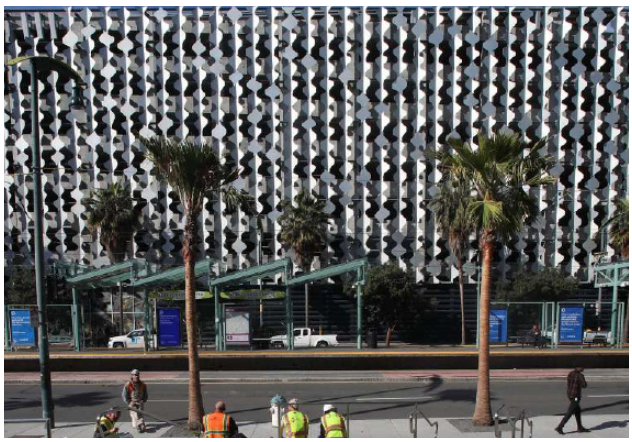


Figure 17. Porous facade. Example: 1630 Third St Parking Structure, San Francisco, CA.

3.4 Lighting, Signage, and Public Art

Carefully integrate lighting, signage, public art, and other elements into the building design.

Lighting should be provided to support pedestrian comfort and safety along sidewalks and throughout open spaces. Lighting should provide general illumination and highlight pedestrian entrances, storefronts, and bus entrances and exits. Lighting should be shielded to mitigate light pollution.

Signage should be provided to aid in way-finding, but it should not be the primary means to identify entrances. Signage should be integrated into entrances and storefronts, and be made of high quality and durable materials. Rectangular internally illuminated signs surface mounted to the building walls are not allowed. Consider ways to creatively incorporate the SFMTA and Muni logos and color palettes into the bus yard signage.

The Project has a public art requirement. While developing the design concept, consider opportunities to incorporate public art that celebrates—without being kitschy—the SFMTA's bus operations and the neighborhood's rich history and arts community as well as other ideas that the San Francisco Arts Commission (SFAC) may identify. Work with the SFAC and the artist(s) to thoughtfully integrate public art into the Facility and/or streetscape design.

Figure 18. Lighting and signage integrated into entrance design. Example: Family House, San Francisco, CA.

Figure 19. Art mural. Example: Vida Building, San Francisco, CA.

Figure 20. Art installation. Example: Kinetic Umbrellas, Project Artaud, San Francisco, CA.

3.5 Ground Floor Uses

The bus yard, residential, and commercial entrances should be located as described in Section 3.1 and should be easily seen and distinguished from one another.

- As described in the Better Streets Plan and Guidelines (www.sfbetterstreets.org) the design of the ground floor uses and right-of-way, including allowance of curb cuts and placement of utilities, has significant impact on the street environment. Decisions regarding street design must consider and prioritize pedestrian safety, enjoyment, and comfort. Reducing driveways reduces the number of conflict points between pedestrians and vehicles and can dramatically improve safety. Maximum widths of industrial curb cuts serving two-way traffic should be 32 feet, though exceptions are permissible if bus or delivery vehicle turning templates require additional width due to the adjacent public street dimension. Where possible, curb cuts should be separated by a minimum dimension of 5' to provide safe waiting space for pedestrians. Vehicular entrances and exits should be kept to the minimum required for efficient and safe operations and should have a warning system. No more than four curb cuts with a total width of 230' shall be allowed on Mariposa Street, and less is desired. In addition one 32 foot wide curb cut for a second floor emergency bus exit shall be allowed.
- Bus and loading vehicular entrances and exits should have a warning system.
- The bus yard pedestrian entrance for the SFMTA employees and visitors should be easily identified to foster identity and way-finding.
- Residential entrance lobbies should be inviting and expressed prominently at the building exterior to foster identity and way-finding.
- Commercial spaces should have inviting storefronts with clear or lightly tinted glazing, high ceilings, and layouts that are flexible to support retail shops, cafes, small scale PDR, and/or community services such arts or educational spaces. The storefront entrances should be at grade and engage the sidewalk so that activity can spill out onto the sidewalk to support typical operations, special events and circumstances such as Covid-19.
- Pedestrian entrances should have weather protection and be well illuminated.
- Emergency exit alcoves should be integrated with entrance and storefront alcoves where possible. Any equipment rooms that must front the sidewalk should be integrated into the overall design.
- Where the bus yard fronts the sidewalk, provide views into the bus yard for visual interest.

Figure 21. Bryant Street frontage illustration prepared for community engagement planning workshop to show possible Project attributes.

4 Streetscape Design Guidelines

The SFMTA led the passage of the The San Francisco Better Streets Plan which aims to improve the quality and character of sidewalks and streets and make them more usable, greener, and safer for all modes of travel.[7]

The plan identifies Bryant, 17th, Hampshire, and Mariposa Streets as mixed-use streets that should have 15 foot wide sidewalks with (building) frontage, through-way, furnishing and (curb) edge zones. In addition 17th Street, which has a bike lane, is a green connection street that links parks, the waterfront, and open space and Hampshire Street is used by bicyclists as an alternative to the busier Bryant Street.[8]

As the City's policy leader and implementer of award-winning streetscapes, the SFMTA is committed to excellent streetscape design. The streetscape should be an exemplar of design that:

- Enhances the Project vision and building design and supports and augments active ground-floor uses.
- Supports SFMTA fleet usage and fosters bicycle and pedestrian activity and safety.
- Integrates sidewalk elements to create a safe, convenient, and inviting public realm

Figure 22. Streetscape zones. Example: San Francisco, CA.

Figure 23. Streetscape with cafe seating in frontage and furnishings zones. Example: San Francisco, CA.

Figure 24. Streetscape with bike racks, street trees, and parking meters integrated in furniture zone . Examples: San Francisco, CA.

7 Mayor Gavin Newsom's introductory letter to the Better Streets Plan: https://sfplanning.org/sites/default/files/archives/Better-Streets/docs/Better-Streets-Plan_Final-Adopted-10-7-2010.pdf, accessed 09/08/2023

8 Planning Department's Green Connections Final Plan: https://sfplanning.org/project/green-connections, accessed 09/08/2023

11 SF Better Streets | A guide to making street improvements in San Francisco: https://www.sfbetterstreets.org/, accessed 09/08/2023

and needed outdoor space due to Covid-19.

Provide at least one bike parking area and one seating area on each frontage. Locate these in relation to the bus yard and residential entrances and the commercial storefronts and to maximize physical comfort considering solar orientation, wind, and noise.

Provide, in accordance with the San Francisco Street Design Advisory Team (SDAT) recommendations, bulb outs, pedestrian ramps, residential loading zones for pick-up/drop-off and package delivery, pedestrian lighting to enhance pedestrian access and safety.

Preserve healthy mature street trees where possible and provide new street trees that will have minimal impact on the trolley bus overhead contact system (OCS) where appropriate.

Integrate stormwater management into the streetscape and support water and local biodiversity conservation by using San Francisco Bay Area native plant species.

Consider opportunities to integrate public art into the streetscape.

Carefully design sidewalks to reduce clutter and integrate signage, lighting, bike racks, seating, landscaping, stormwater management, and possible public art. Consolidate OCS, lighting, and signage poles or replace OCS poles with catenary attached to the building.v

Figure 26. Parklet with planter that provides a buffer from street traffic. Example: San Francisco, CA.

Figure 27. Public art bench. Example: Chinatown, San Francisco, CA.

Figure 25. Special Tree Grates. Example: Valencia Street, San Francisco, CA.

The New Potrero Yard Design Guidelines

The SFMTA is committed to encouraging sustainable modes of travel. The Project will include a robust Transit Demand Management (TDM) program. Transit Demand Management (TDM) elements that support active (walking and biking) and high occupancy vehicle transportation (bus, shuttle, van pool) use should be located for easy access and use and integrated into the design, rather than added as an afterthought.

Figure 29. Bike Storage, Example: Ashby BART Station

Figure 28. Mariposa Street frontage illustration prepared for community engagement planning workshop to show possible Project attributes.

Division 3: Design Criteria Document

Potrero Yard: 3-Level Bus Facility Design Criteria Document

San Francisco Municipal Transportation Agency

October 2024

SFMTA

INTRODUCTION

TABLE OF CONTENTS

Table of Contents

ABBREVIATIONS

Abbreviations

A	=	Amperes
AABC	=	Associate Air Balance Council
AAMA	=	American Architectural Manufacturer Association
AC	=	Air Conditioning
AC/DC	=	Alternate Current/Direct Current
ACS	=	Access Control Server
ADA	=	American Disabilities Act
AEP	=	American Electric Power
AFF	=	Above Finished Floor
AHJ	=	Authority Having Jurisdiction
AHRI	=	Air conditioning Heating & Refrigeration Institute
AISC	=	American Institute of Steel Construction
AISI	=	American Iron & Steel Institute
Alum	=	Aluminum
AMCA	=	Air Movement & Control Association
ANSI	=	American National Standards Institute
ANSI/ AWC	=	American National Standards Institute/ American Wood Council
ANSI/ IWCA	=	American National Standards Institute/ International Window Cleaning Association
ASCE	=	American Society of Civil Engineers
ASCE/ SEI	=	American Society of Civil Engineers/ Structural Engineering Institute
ASHRAE	=	American Society of Heating and Refrigeration Association of Engineers
ASJ	=	All Service Jacket
ASME	=	American Society of Mechanical Engineer
ASTM	=	American Society for Testing & Materials
ATF	=	Automatic Transmission Fluid
AWWA	=	American Water Works Association
BACnet	=	Building Automation and Control Network
BAS	=	Building Automation System
BEB	=	Battery Electric Buses
BICSI	=	Building Industry Consulting Service International
BRBF	=	Buckling Restrained Brace Frame
Btu	=	British Thermal Unit
CA	=	Compressed Air
CAL Green	=	California Green Building Standards Code
CAT	=	Collision Avoidance Technologies
CBC	=	California Building Code
CCTV	=	Closed Circuit Television
CE	=	Computer Equipment
CEC	=	California Energy Code
CF	=	Contractor Furnished
CFC	=	California Fire Code
CFM	=	Cubic Feet Per Minute
CFR	=	Code of Federal Regulations
CG	=	Chassis Grease
CI	=	Contractor Installed
Circ	=	Circulation
CMC	=	California Mechanical Code
CMU	=	Concrete Masonry Unit
CO	=	Carbon Monoxide
CO2	=	Carbon Dioxide
COMM	=	Communication
CPAA	=	Concrete Polishing Association of America
CPC	=	California Plumbing Code
CPVC	=	Chlorinated Polyvinyl Chloride
C.R.	=	Changing Room
CSA	=	Civil Structural Architectural
CWA	=	Common Work Area
DASMA	=	Door and Access Systems Manufacturers Association
dB(A)	=	Decibels, A-Weighted
DC	=	Direct Current
DCM	=	Design and Construction Management
DCOF	=	Dynamic Coefficient of Friction
DCD	=	Design Criteria Document
DDC	=	Direct Digital Controls
DEF	=	Diesel Exhaust Fluid
Demo	=	Demolition
Div	=	Division
DX	=	Direct Expansion
EC	=	Engine Coolant
EFCO	=	Economy Forms Company
Elec	=	Electrical
EMCS	=	Energy Management Control System
EMS	=	Energy Management System
EMT	=	Electrical Metallic Tubing
EO	=	Engine Oil
EPDM	=	Ethylene Propylene Diene Monomer
ESFR	=	Early Suppression Fast Response
EV	=	Electric Vehicle
fc	=	Foot Candle
f'm	=	Compressive Strength
F/Btu	=	Fahrenheit/British thermal unit
FACP	=	Fire Alarm Control Panel
FDC	=	Fire Department Connection
FEVE	=	Fluoroethylene Vinly Ether
FPS	=	Feet Per Second
fy	=	Force to Yield
GFI	=	Ground Fault Interrupter
GO	=	Gear Oil
GPF	=	Gallons Per Flush
GPM	=	Gallons Per Minute
GSF	=	Gross Square Feet (within the exterior face of exterior walls)
GS6	=	General Schedule 6 Form
H2	=	Hydrogen
H2O	=	Water
HCFC	=	Hydrochlorofluorocarbon
HDPE	=	High Density Polyethylene
HET	=	High Efficiency Toilet
HFHC	=	Hydrochlorofluorocarbons
HO	=	Hydraulic Oil
HP	=	Horse Power
HPC	=	High Performance Computing
HVAC	=	Heating, Ventilation and Air Conditioning
IBC	=	International Building Code
ICC	=	International Code Council
IFC	=	Industry Foundation Classes
IGMAC	=	Insulating Glass Manufacturers Association of Canada
IGCC	=	Insulating Glass Certification Council
IDF	=	Intermediate distribution frame
IES	=	Illuminating Engineering Society
IPLV	=	Integrated Part Load Value
J-STD	=	Joint Standard

ABBREVIATIONS

Abbreviation		
K	=	1,000 Pounds
ksi	=	Kilopound per square inch
kVA	=	kiloVolt Ampere
LAN	=	Local Area Network
lb	=	Pound
LCC	=	Low Cost Carriers
LED	=	Light Emitting Diode
LEED	=	Leadership in Energy and Environmental Design
LEL	=	Lower Limit Explosive Limit
LLWA	=	Lower Level Work Area
LSIG	=	Long time, short time, instantaneous, ground
Max	=	Maximum
MaP	=	Maximum Performance
MCB	=	Motor Coach Buses
MDF	=	Main Distribution Frame
Mech	=	Mechanical
MERV	=	Minimum Efficiency Reporting Value
MIG	=	Metal Inert Gas
Min	=	Minimum
MME	=	MUNI Metro East
MOH	=	Friedrich Mohs scale of mineral hardness
MPOE	=	Main Point of Entry
MR	=	Low temp liquid, emulson, vapor, permeable air membrane
MRO	=	Maintenance, Repair, & Operations
MSS	=	Manufacturers Standardization Society
MTC	=	Main Telecommunication Center
MS/TP	=	Master Slave/Token Passing
MUD	=	Mixed Use Development
MW	=	Megawatt
NEBB	=	National Environmental Balance Bureau
NEC	=	National Electric Code
NEMA	=	National Electrical Manufacturers Association
NFPA	=	National Fire Protection Association
NFRC	=	National Fenestration Rating Council
NO2	=	Nitrogen Dioxide
NRCA	=	National Resources Conservation Authority
OC	=	Overhead Cabinet
OCS	=	Overhead Contact System
OF	=	Owner Furnished (same as City Furnished, in all instances)
OI	=	Owner Installed (same as City Installed, in all instances)
OSHA	=	Occupational Safety and Health
OS&Y	=	Outside Stem & Yoke
PA	=	Public Address
PC	=	Personal Computers
PCI	=	Pre-Construction Information
PDA	=	Preliminary Development Agreement
PDI	=	Plumbing and Drainage Institute
PDI-WH	=	Plumbing and Drainage Institute-Wall Hydrant
PDR	=	Production Distribution Repair
PES	=	Portable Equipment Storage
PLC	=	Programmable Logic Controller
PM	=	Preventive Maintenance
PPC	=	Principal Project Company
PPG	=	Pittsburgh Plate Glass Company
PROM	=	Programmable Read-Only Memory
PS	=	Power Steering
psf	=	pounds per square foot
PSI	=	Pounds Per Square Inch
PSIG	=	Pounds Per Square Inch Gauge
PVC	=	Polyvinyl Chloride
PVDF	=	Polyvinylidene Fluoride
RDC	=	Reference Design Concept
RFID	=	Radio-Frequency Identification
RFP	=	Request For Proposal
RLWP	=	Roof Level Work Platform
SCADA	=	Supervisory Control and Data Acquisition
SDI	=	Steel Door Institute
sf	=	Square Feet
SFFD	=	San Francisco Fire Department
SFPUC	=	San Francisco Public Utilities Commission
SGCC	=	Safety Glazing Certification Council
SHGC	=	Solar Heat Gain Coefficient
SNMP	=	Simple Network Management Protocol
STC	=	Sound Transmission Class
Struc	=	Structural
TABB	=	Testing, Adjusting, and Balancing Bureau
TB	=	Trolley Buses
TBD	=	To Be Determined
TBS	=	ToolBox Storage
TC	=	Task Chair
TCNA	=	Tile Council of North America
TCP/IP	=	Transmission Control Protocol/Internet Protocol
TIA/EIA	=	Telecommunication Industries Association/ Electronic Industries Alliance
TIG	=	Tungsten Inert Gas
TMS	=	The Masonry Society
TPO	=	Thermoplastic Polyolefin
TPSS	=	Traction Power Substation
TR/TC	=	Telecommunications Room/ Telecommunications Closet
Typ	=	Typical
UC	=	Used Coolant
UL	=	Underwriters Laboratories
UNO	=	Unless Noted Otherwise
ULWP	=	Upper Level Work Platform
UO	=	Used Oil
UPS	=	Uninterruptible Power Supply
USGBC	=	United States Green Building Council
UV	=	Ultraviolet
V	=	Volts, Alternating Current
VAV	=	Variable Air Volume
VCT	=	Vinyl Composite Tile
VFD	=	Variable Frequency Drive
VLAN	=	Virtual Local Area Network
VLM	=	Vehicle Lift Module
VOC	=	Volatile Organic Compound
VSS	=	Video Surveillance System
W	=	Water
WAN	=	Wide Area Network
WC	=	Water Closet
WDMA	=	Window and Door Manufacturers Association
wg	=	Water gauge
WWF	=	Windshield Washer Fluid

SECTION 1 - INTRODUCTION

1.0 INTRODUCTION

The San Francisco Municipal Transportation Agency (SFMTA) has engaged a consultant team led by Hatch Associates Consultants (the Hatch Team) to analyze the feasibility of developing non-transit uses above or adjacent to the SFMTA's bus maintenance and storage yards. The Potrero Yard Bus Facility Design Criteria Document has initially focused on joint development opportunities at the Potrero Yard, which will be the first of the SFMTA's older bus yards to be rebuilt.

SFMTA has directed that any joint development at Potrero Yard must not impede the core transit function of the facility if rebuilt. The integration of joint development with the reconstruction of the Potrero Yard has been an integral part of these activities and also for the Project's procurement.

Potrero Yard (located at 2500 Mariposa Street in the Mission District and opened in 1915) currently serves as one of two SFMTA Electric Trolley Bus (Trolley Bus) Operations and Maintenance facilities. The existing two-level facility includes bus parking, service (fare recovery and wash lane), and a ten-lane maintenance facility at grade, accessed via Mariposa Street. The second level includes bus operations space, non-revenue vehicle parking, trolley bus parking, a tire bay/shop, and a body bay/shop accessed via 17th Street. The Potrero Yard Modernization Project will demolish the existing facility and construct a new, expanded bus maintenance and operations facility on the site. The new facility will serve the existing Trolley Bus Fleet and will be the SFMTA's first purpose-build battery-electric bus facility. The facility will also house the SFMTA's transit operator training classrooms, as well as Street Operations, the SFMTA's street incident response team.

The Design Criteria Document prescribes technical, functional, and performance requirements for the Potrero Yard Bus Yard Component's building systems including architectural, civil, structural, equipment, mechanical, electrical, and plumbing. This document is attached to the Potrero Yard Division 3 (*Design Criteria Document*) of the Technical Requirements. The Design Criteria Document was prepared by transit design specialist HDR | Maintenance Design Group (HDR | MDG) in close coordination with urban design specialist SITELAB Urban Studio, transit operations specialist CHS, and real estate advisory firm Hatch (the Hatch team). Technical building and building system requirements for the Housing and Commercial Component are not addressed here, but can be found in Divisions 4 (*Design Criteria for the Housing and Commercial Component*) and Division 6 (*Program for the Housing and Commercial Component*) of the Technical Requirements.

1.1 Sources Consulted

The Bus Facility Design Criteria Document is informed by discussions with the SFMTA subject matter experts during the Potrero Yard Design Charrette held on January 31 through February 2, 2018 as well as the Hatch Team's review of the following studies, reports, and analyses prepared by or on behalf of the SFMTA.

- SFMTA Facilities Framework Addendum (10/6/17)
- SFMTA Master Plan Report (7/28/17)
- SFMTA Transit Fleet Management Plan (2014, amended 2017)
- SFMTA Zero Emission Bus Rollout Plan (2021 draft)

Follow up in-person interviews with the SFMTA also took place in September 2018 and December 2018, with a conference call also held in November 2018. Between 2018 and publication in 2021, SFMTA staff were consistently consulted to finalize details and review drafts of this document.

1.2 Design

Following in-depth discussions with SFMTA staff on required bus program, overlain with HDR's industry best practices recommendations, the SFMTA and the Hatch team produced a Reference Design Concept (RDC) that is generally consistent with the Technical Requirements which is Document 1 (*Reference Design Concept)* of the Reference Documents. The RDC is one expression of general conformance to this Design Criteria Document.

Tables 1.A and 1.B identify the quantitative capacity of bus fleet vehicles and square footage summaries in the RDC. All required bus storage programming numbers are based on a design capacity representing the bus storage number the facility can accommodate using parking spaces and several (approximately half) of maintenance bays. The SFMTA refers to this design capacity methodology as "planning capacity." Table 1.A lists the 2030 programming bus capacity numbers. Table 1.B contains the 2030 overall programming square footage numbers.

The following is a list of Design Principles established during planning:

- Minimize impact of bus circulation on the neighborhood.
- Provide improved efficiency and seismic performance.

SECTION 1 - INTRODUCTION

TABLE 1.A - **POTRERO YARD PROGRAM SUMMERY AT SUBSTANTIAL COMPLETION OF THE INFRASTRUCTURE FACILITY***

	TROLLEY BUS		TOTAL	MAINT.	BUS : BAY
	40'	60'	BUSES	BAYS	RATIO***
Potrero Bus Yard	153	93	246	13	19

*All figures are planning capacities and represent the fleet mix at Potrero Yard when the Yard is completed in 2026. The fleet mix will ultimately transition to 100 percent battery electric.

***Ratio is total for all Repair Bays and Preventive Maintenance Bays based on a ratio of 17:1. Does not include speciality bays like tire bay, body bay, and chassis wash bay.

TABLE 1.B - REFERENCE DESIGN CONCEPT PROGRAM SUMMARY AREA (SF)

	PARKING	MAINT. BAY/SHOPS	SERVICE & CLEAN	PARTS	MAINT. ADMIN	OPS.	TRANSIT SVCS.	SHARED	TRAINING	BODY/ PAINT	TOTAL
Potrero Bus Yard	299,215	48,252	10,921	8,806	9,423	14,017	8,519	15,390	17,819	---	432,362

- Promote mixing and socializing across divisions.
- Provide well laid out Dispatch and check-in spaces.
- Facilitate good relationship between operators, supervisor, and dispatch spaces.
- Enhance ability for on-time pull-out.
- Provide flexibility in bus parking and crush capacity.
- Enhance good communication between functional areas.
- Efficient and safe movements of vehicle and pedestrians.
- Incorporate daylight as much as possible given the site and building constraints.
- Create good line of signt from Dispatch to pull-in and pull-out of buses, including design options such as:
  - ✓ Windows with direct or indirect views of interior bus operations.
  - ✓ Use of technology such as cameras for improved security and more efficient operations.
- Utilize durable, easy to clean casework.
- Provide adequate lockers and space – well lighted and ample clearance between lockers.
- Provide a facility that is welcoming, uncluttered, appreciated, presents a discrete public face, and instills employee pride and ownership

1.3 Report Overview

This Bus Facility Design Criteria Document consists of five sections, which are described briefly here.

Section One - Introduction. This section describes the background of the project and provides an overview of the Bus Facility Design Criteria Document.

Section Two - Space Needs Program. This section presents a detailed listing of space requirements for Parking, Bays and Shops, Service and Clean, Parts, Maintenance, Operations, Shared Areas, and Training.

Programmed spaces are further defined by their quantity, area, and any remarks significant to design. Information began and then was updated using information from the 2017 SFMTA Facilities Framework Addendum, published in October 2017.

Section Three - Design Criteria Narrative. This is the first of two design criteria sections. The Design Criteria Narrative presents a narrative version of the functional.

Section Four - Performance Requirements. This section describes the requirements per design discipline.

Section Five - Requirements for Bus Yard Component Space Modules. This is the second of two design criteria sections. This section presents a graphic version of the functional and performance requirements and is organized by functional space as presented in the Space Needs Program.

Appendices:
Appendix A: Maintenance Equipment Manual
Appendix B: SFMTA OCS Design Criteria
Appendix C: SFPUC Application for Electrical Service (For Reference)

Appendix D: Traction Power Feeder Map
Appendix E: Sample Route Schedules
Appendix F: Security Sensitive Information Process Regarding Traction Power Standard Specifications
Appendix G: Design Criteria Paratransit (For Reference)
Appendix H: PG&E System Impact Study Report for Mixed Use Service Application (For Reference)
Appendix I: SDAT Review Letter 1.19.2023 (For Reference)
Appendix J: Geotechnical Baseline Report

The Design Team prepared the Design Criteria Document, Maintenance Equipment Manual, Building Drawings, and Equipment Drawings to Reference Design Concept prepared by the SFMTA prior to the Project's procurement, CEQA Project Description, and the basis for the programmatic and functional requirements for the Project's procurement. The Maintenance Equipment Manual is included as Appendix A in this Design Criteria Document.

1.4 Acknowledgments

The Hatch Team would like to acknowledge the efforts and contribution of the SFMTA staff members during the development of the design charrette process and input to matters related to the development of the Bus Facility Design Criteria Document. This continued enthusiastic participation and dedication will ensure the realization of the Potrero Yard program.

SECTION 2 - SPACE NEEDS PROGRAM

2.0 INTRODUCTION

This section presents the Space Needs Program for the Potrero Yard. The Space Needs Program defines the minimum space requirements for efficient operations. The program is summarized at the end of this section, and includes projected square footage needs for building and exterior areas.

All required programming numbers are planning, not crush, capacity. The Space Needs Program was used as the basis to develop the Reference Design Concept that, which is Document 1 (*Reference Design Concept)* of the Reference Documents.

All spaces in the proposed bus yard concept should be within 10% +/- of the programmed square footages listed in Table 2.E.

2.1 Staff Summary

Minimum facility staffing levels that are either required or planned by the SFMTA are crucial to planning efforts when determining the size of support facilities and developing occupancy levels. Table 2.A shows the summary of facility staffing levels.

2.2 Vehicle Parking Summary

The following Table 2.B is the summary of vehicles.

TABLE 2.A - POTRERO YARD PROGRAM STAFFING SUMMARY AT SUBSTANTIAL COMPLETION OF THE INFRASTRUCTURE FACILITY*

Function	Potrero Staff
Bays & Shops	10
Service & Clean	37
Parts	21
Maintenance - Administration	10
Mechanics & Technicians	90
Operations - Administration	22
Operators	684
Transit Services	192
Shared	1
Training	63
TOTAL	**1,130**

TABLE 2.B - POTRERO YARD PROGRAM VEHICLE SUMMARY AT SUBSTANTIAL COMPLETION OF THE INFRASTRUCTURE FACILITY*

Function	Scenario 1 Potrero Vehicles
40' Bus	153
60' Bus	93
Large Non-Rev Vehicle	5
Standard Non-Rev Vehicle	84
Transit Services	68
TOTAL	**403**

*All figures are planning capacities
**An estimated 10-20 NRV spaces may be considered for BYC Transportation Demand Management programming

[1] The square footages in the Drawing Package may not match exactly those of the Program, but the Program has guided the formulation of the Drawing Package.

SECTION 2 - SPACE NEEDS PROGRAM

2.3 Planning Ratio

Table 2.C lists only the key/major planning ratios. For a complete list of the square footages for each type of use, refer to the Space Needs Program in Table 2.E.

TABLE 2.C - PLANNING RATIO

SPACE	RATIO OR SPACE STANDARDS*
Bus Repair Bay (20’ x 75’)	1 bay for every 20 buses to be maintained
Preventive Maintenance (PM) Bay (20’ x 75’)	1 bay for every 50 buses to be maintained
Tire Bay (20’ x 75’)	1 bay for every 125 buses to be maintained
Minor Body Repair Bay (20’ x 75’)	1 per facility
Chassis Wash Bay (25’ x 75’)	1 bay for every 200 buses to be maintained
Service Position (20’ x 70’)	1 bay for every 75 buses
Bus Washer (20’ x 100’)	1 bay for every 150 buses
Water Reclamation (15’ x 60’)	1 per facility, handles multiple bus washers
Tool Box Storage	24 square feet (sf) per Maintenance Technician
Tire Storage	5 sf per bus for 1 tire per bus
Parts Storage	20 sf per bus with High Density Storage System

*For Potrero Yard, all bays are designed to be used by both 40’ and 60’ buses.

SECTION 2 - SPACE NEEDS PROGRAM

2.4 Space Standards

Space standards were applied to the Space Needs Program and generally apply to the Offices, Shops, Bays, and Vehicle Parking Areas. Area requirements in Shops and Storage Areas were derived from functional requirements and equipment space needs. The space standards listed are the minimum required space square footages.The space standards listed in Table 2.D were utilized to develop the facility program and overall area requirements. The space standards are based on functional needs and requirements.

TABLE 2.D - SPACE STANDARDS

AREA	SIZE
SHOPS & STORAGE:	
Common Work Area	500 sf
Trolley Bus Electronics Shop	1,000 sf
Portable Equipment Storage	600 sf
Tool Storage	150 sf
Tire Shop	600 sf
Lube Room	400-600 sf
Compressor Room	200 sf
Bench Shop	300 sf
Cleaning Equipment Storage	200 sf
Battery Storage	200-300 sf
Parts Window	200 sf
Shipping and Receiving	600 sf
Loading Dock	900 sf (15 x 60)
PARKING:	
40’ Transit Bus	540 sf (12 x 45)
60’ Bus	780 sf (12 x 65)
Large Non- Revenue Vehicles	420 sf (12 x 35)
Standard Non-Revenue Vehicles	200 sf (10 x 20)
CIRCULATION:	
Aisles for 90 degrees turns	65’ turning into parking lanes or service
Aisles for 90 degrees turns	70’ turning into maintenance bays
Bypass Lane	20’ wide
One Way Ramp	15’ wide
Forklift Circulation	10’ wide

SECTION 2 - SPACE NEEDS PROGRAM

2.5 Circulation Factors

Circulation factors have been applied to interior building spaces; exterior circulation is unnecessary as the Potrero Yard will occupy the entire site. The space requirements shown for each function are net usable area.

2.6 Interior or Building Circulation

Circulation factors are applied to the program as a percentage of the total building square footage. These factors account for miscellaneous building spaces such as hallways, stairwells, wall thickness, structure (Circ/Mech/Elec/Struc - Net:Gross), and access requirements. The following is a list of the minimum required factors that have been applied to the program:

- Parking 75%
- Bays and Shops 20%
- Service and Clean 10%
- Parts 10%
- Maintenance - Admin. 35%
- Operations - Admin. 35%
- Transit Services (MRO) 35%
- Shared 35%
- Training 35%

2.7 Minimum Design Requirements

- Total Bus Parking Planning Capacity is 246 trolley buses.
- The full space needs program shall be accommodated on four levels and a basement, to the extend a basement is needed.
- Unique 100 percent drive-through, bus maintenance facility that include:
  - ✓ 70-foot internal drive aisle
  - ✓ Ten Bus Repair Bays
  - ✓ Five PM/Inspection Bays
  - ✓ Tire Bay(s), Shop and Storage
  - ✓ One Miscellaneous Body Repair Bay
  - ✓ Support Shops and Storage Areas,
  - ✓ Parts Storage Warehouse with dedicated delivery dock
  - ✓ One Bus Washer per bus parking level
  - ✓ Dedicated Mechanical Systems Yard with a water reclamation equipment area.
- The top and bottom 40 feet of the ramp shall be a maximum 5 percent slope with the remainder of the ramp at a maximum slope of 10 percent.
- There is vertical space available over shops, offices, and other spaces within the maintenance areas not requiring 20-foot clearances.
- Access to the upper level joint development uses shall be provided via appropriate vertical circulation access points that preserve the SFMTA facility's security and that are safe and functional for the joint development opportunities.
- Bus turning radius has been evaluated within the building. The site and street bus turning radius shall be reviewed for conformance to performance base throughout design and construction.
- The Principle Project Company (PPC) must apply and show turning templates on drawings, and it has to be agreed upon that they are sufficient and work for circulation. SFMTA reserves the right to request a turning simulation to demonstrate that vehicles can maneuver safely if turning template is tight.
- The following uses had been envisioned on the basement and must be included on the site:
  - ✓ SFMTA loading
  - ✓ Full building waste management and pickup
  - ✓ Access to lower-level work areas
  - ✓ Car-share spaces
  - ✓ No public access
- Staff work areas shall be located in an above-grade, naturally lit location while accommodating the required spaces and adjacencies. To the extent feasible, include access to private outdoor spaces from staff break areas and rest spaces.

2.8 Space Needs Program & Summary

A summary of the Space Needs Program is provided below. The summary tables include projected square footage needs for building areas, parking, and staff totals.

These projected space needs are subtotaled into net square footage requirements. The detailed Space Needs Program begins with the identification of each space by name and a space standard (if applicable). The space column represents spaces required to accommodate the fleet and operation for the final build out.

Table 1.B gives an overall square footage for each large area indicated. Table 2.E is a detailed program for each space required. Table 2.E totals are not identical to the actual square footages within the RDC but the design of the RDC was informed by Table 2.E.

The above minimum requirements notwithstanding, the design shall meet all other program, functional, and space requirements within a maximum square footage deviation of ±10% applied to each function as shown in Table 2.E- Space Needs Program.

2.9 Battery Electric Bus Fleet Infrastructure

In accordance with the CA Air Resources Board Innovative Clean Transit legislative mandate, the SFMTA is transitioning its fleet to battery-electric buses. Potrero Yard currently operates a fleet of trolley buses, and the new facility will need to account for the existing fleet, the future battery-electric fleet, and the future transition between the two propulsion technologies.

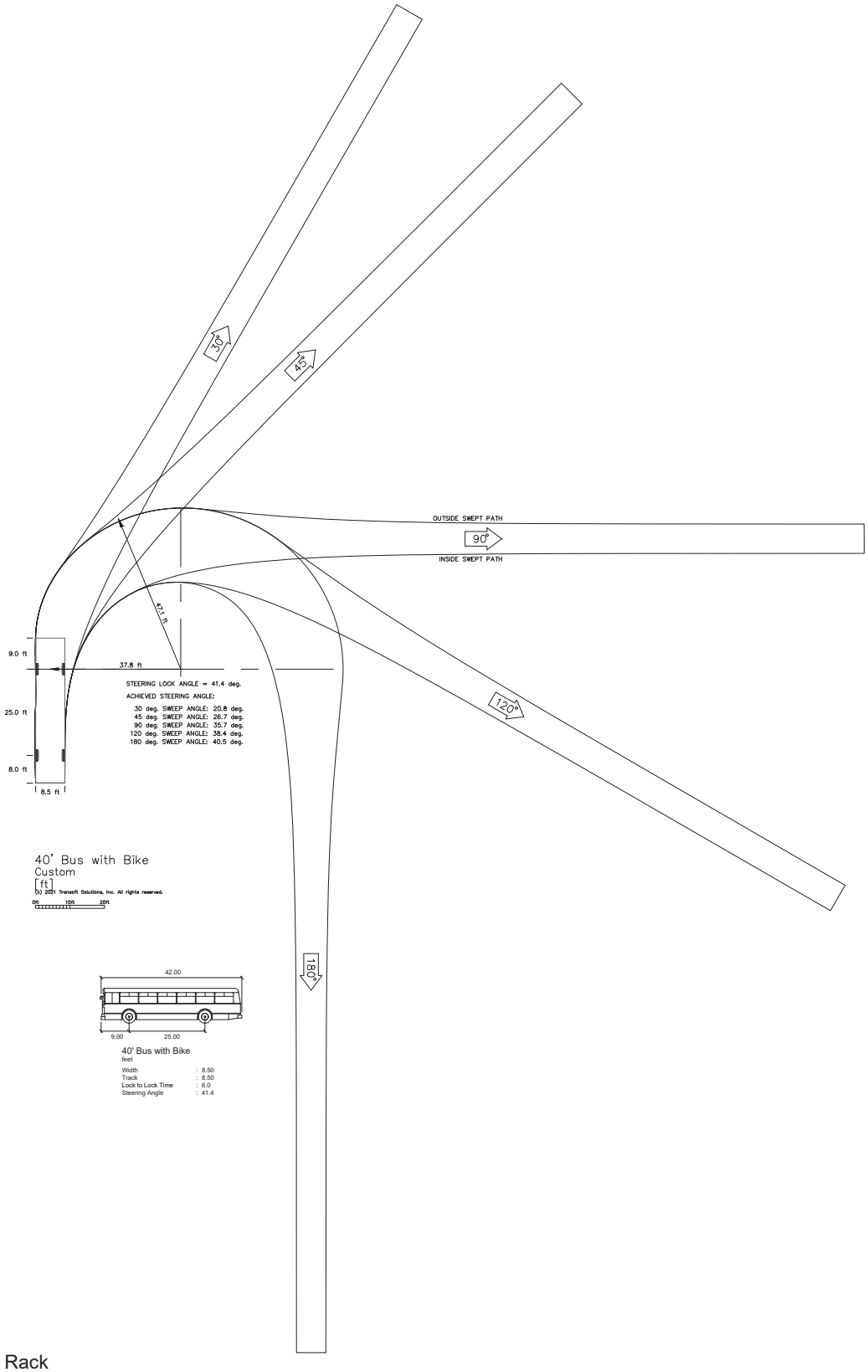
While compliance with this DCD is required and mandated, design and implementation of BEB infrastructure is envisioned as more of a progressive design process. Refer to Division 5 (*Battery-Electric Bus Supplemental Criteria)* of the Technical Requirements for BEB requirements and considerations.

2.10 Minimum Clearance and Design Requirements

The following are minimum clearance and design requirements for the different levels of the Bus Yard Component:

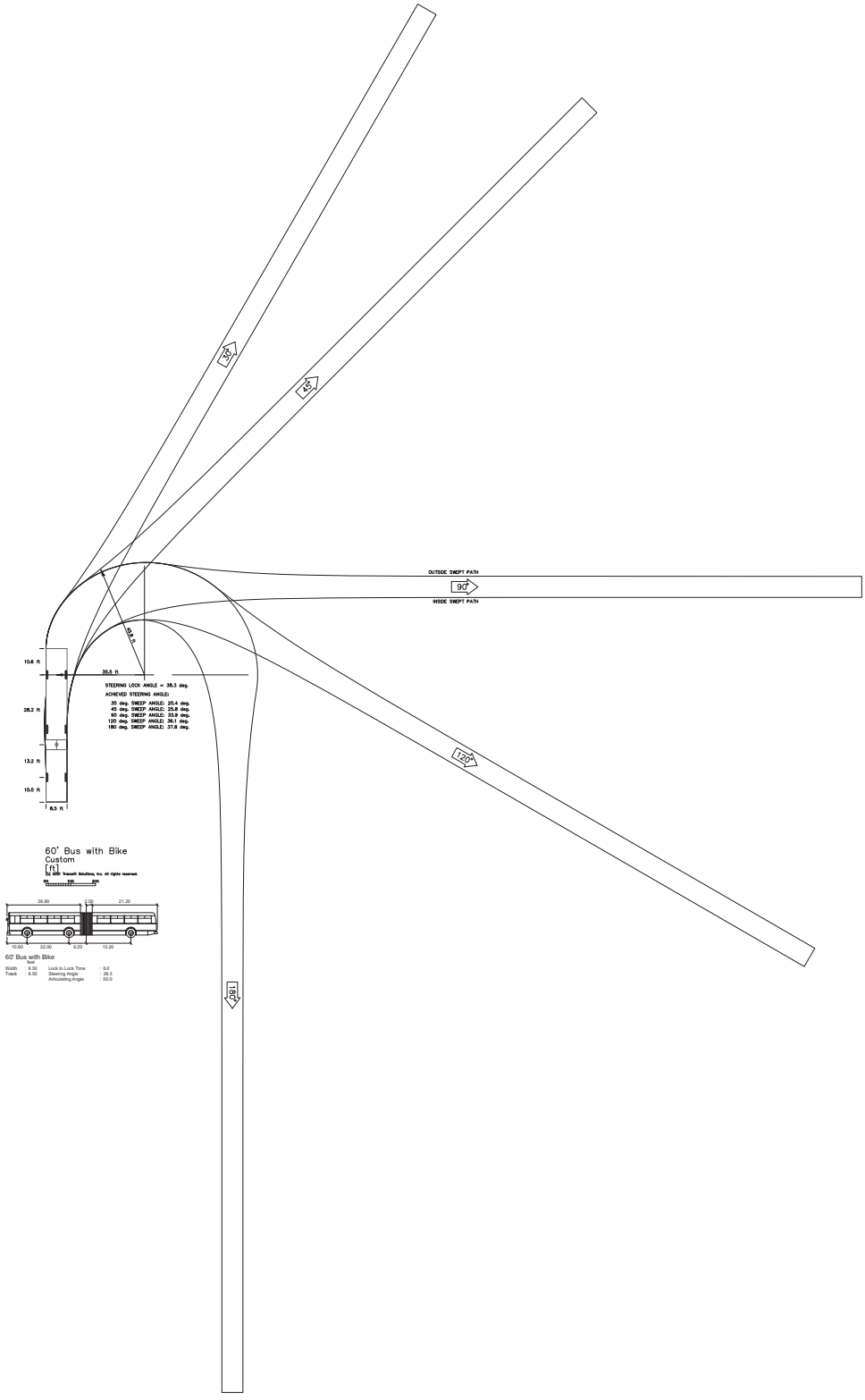
- For the minimum drive aisle for bus turning, see Table 2.D.
- The minimum turning radii for buses is 36’-43’, depending on degree of turn. See 40’ and 60’ turning template models in Exhibits 1 and 2.
- Vertical circulation for under the catwalks is 20 feet.
- The bus floor levels of the Bus Yard Component should be designed for the full bus live load, reglardless of whether the floor plans indicate other non-bus uses.
- Vertical clearance listed in the DCD is the minimum clearance height to any structure, system, building components or equipment, or fixtures.

EXHIBIT 1



40' Bus with Bike Rack
Scale - 1:20

EXHIBIT 2



60' Bus with Bike Rack
Scale - 1:30

SECTION 2 - SPACE NEEDS PROGRAM

TABLE 2.E - SPACE NEEDS PROGRAM

FUNCTION	SPACE STANDARD			SCENARIO 2 POTRERO STAFF OR VEHICLES	NUMBER OF SPACES	UNIT SIZE (sf)	SUBTOTAL (sf)					COMMENTS
PARKING												
40' Bus	12	x	45	153	153	540	82,620					The number split between 40' and 60' buses may be modified based on the BEB technology. Reference the E-Bus Performance Requirements Document. Five of these spaces should be provided adjacent to the maintenance bays & shops for down bus parking.
60' Bus	12	x	65	93	93	780	72,540					The number split between 40' and 60' buses may be modified based on the BEB technology. Reference the E-Bus Performance Requirements Document. Five of these spaces should be provided adjacent to the maintenance bays & shops for down bus parking.
TOTAL BUSES				**246**								
Large Non-Rev Vehicle	12	x	35		5	420	2,100					Operations and maintenance; All non-revenue vehicles will be electric vehicles
Standard Non-Rev Vehicle	10	x	20		84	200	16,800					Operations and maintenance; All non-revenue vehicles will be electric vehicles
Large Non-Rev Vehicle	12	x	35		3	420	1,260					Transit Services (MRO); Sprinter Command Vehicles; All non-revenue vehicles will be electric vehicles
Standard Non-Rev Vehicle	10	x	20		65	200	13,000					Transit Services (MRO); 45 pickups and 20 sedans; All non-revenue vehicles will be electric vehicles
Stationary Engineer Non-Revenue Vehicle	12	x	35		1	420	420					F250 with crew cab
Building Maintenance Non-Revenue Vehicles	12	x	35		3	1,260	3,780					For FIT/B&G
Assignable Area							**192,520**					
Net: Gross (75%)							**336,910**					
BAYS & SHOPS												
Running Repair Supervisor	64			3	3	64	192					Workstation, Shared office with PM Supervisor
Control Room - Clerk	64			2	2	64	128					Workstation, Shared Office
Floor Supervisor	64			2	2	64	128					Workstation, Shared Office
Preventive Maintenance Supervisor	64			2	2	64	128					Workstation, Shared Office with RR Supervisor
Electronic Supervisor	64			1	1	64	64					Workstation
60' Bus Repair Bay	75	x	20		10	1,500	15,000					Mix of parallelogram and inground lifts; one shared with Minor Body Repair Bay
60' Bus Preventive Maintenance	75	x	20		5	1,500	7,500					All pit and roof level bays
60' Bus Tire Bay	75	x	20		2	1,500	3,000					Two, if space allows
60' Bus Minor Body Repair	75	x	20		2	1,500	3,000					Shared with a Repair Bay
60' Bus Chassis Wash	75	x	25		1	1,875	1,875					
TOTAL BAYS					**20**							
TOTAL BAYS & SHOP STAFF				**10**								

SECTION 2 - SPACE NEEDS PROGRAM

TABLE 2.E - SPACE NEEDS PROGRAM

FUNCTION	SPACE STANDARD			STAFF OR VEHICLES	NUMBER OF SPACES	UNIT SIZE (sf)	SUBTOTAL (sf)	COMMENTS
				SCENARIO 2 POTRERO				
Common Work Area					2	500	1,000	
Portable Equipment Storage					2	600	1,200	
Tool Box Storage			24		1	2,160	2,160	Total Mechanics and Technicians listed under Maintenance Admin
Tool Storage					1	150	150	Access off of Shop floor
AC Shop/Storage					1	500	500	
Battery Rebuild Shop					1	500	500	
Tire Shop					1	600	600	
Tire Storage			5		1	1,065	1,065	5 sf per total bus number
Lube Room					1	600	600	
Compressor Room					1	200	200	
Minor Body Shop					1	400	400	With workstation
Electronic Shop Workstations			30		4	30	120	Workstations, adjacent to Electronic Bench Shop
Electronic Bench Shop					1	600	600	Space for six electric benches test equipment space
Telecommunication Room					1	100	100	
Assignable Area							**40,210**	
Net: Gross (20%)							**48,252**	
FARE BOX & CLIPPER CARD READER REPAIR SHOP								This section of the space needs program is not included in the Reference Design Concept. Developer's bus yard design submission must include a Fare Box & Clipper Card Reader Repair Shop.
Manager				1	1	120	120	Private Office
Fare Box Staff				12	12	64	768	Shared Office with space for shared computers
Incoming & Outgoing Device Storage					1	350	350	
Shop					1	300	300	
Storage					1	200	200	Secure
Parts Storage					1	600	600	
Assignable Area							**2,338**	
Net: Gross (20%)							**2,806**	
SERVICE & CLEAN								
Service Supervisor Office			64	2	2	64	228	Shared Office with space for shelves
Service Position	20	x	70		3	1,400	4,200	
Bus Washer	20	x	100		2	2,000	4,000	
Water Reclamation					1	900	900	
Cleaning Equipment Storage					3	200	600	
Assignable Area							**9,928**	
Net: Gross (10%)							**10,921**	
CLEANING STAFF				**35**				
CLEANING STAFF TOTAL				**37**				

TABLE 2.E - SPACE NEEDS PROGRAM												
					SCENARIO 2 POTRERO							
FUNCTION	SPACE STANDARD			STAFF OR VEHICLES	NUMBER OF SPACES	UNIT SIZE (sf)	SUBTOTAL (sf)					COMMENTS
PARTS												
Parts Supervisor			120	1	1	120	120					Private Office
Parts Lockers			7		15	7	105					
Break Room					1	200	200					
Gender Neutral Restroom						100	100					
Parts Storage			20		1	4,920	4,920					Freight elevator adjacent to Parts Storage. Feight elevator shall have access to all bus levels.
Battery Storage					1	300	300					Adjacent to Parts, temp controlled to 60 degrees
Parts Shopkeeper			64	5	5	64	320					Workstation
Parts Window					1	200	200					
Staging					1	600	600					Located in Basement; secured from any publicly accessible and joint development spaces
Receiving Office					1	300	300					Two workstations, file cabinets, valuable items storage
Shipping & Receiving					1	600	600					
Dock					1	900	900					
Assignable Area							**8,665**					
Net: Gross (10%)							**9,532**					
PARTS STAFF				**21**								

SECTION 2 - SPACE NEEDS PROGRAM

TABLE 2.E - SPACE NEEDS PROGRAM

FUNCTION	SPACE STANDARD			SCENARIO 2 POTRERO STAFF OR VEHICLES	NUMBER OF SPACES	UNIT SIZE (sf)	SUBTOTAL (sf)					COMMENTS
MAINTENANCE												
ADMINISTRATION												
Superintendent			224	1	1	224	224					Private Office
Assistant Superintendent			120	1	1	120	120					Private Office
Senior Controller			120	1	1	120	120					Private Office
Administrative Assistant			64	2	2	64	128					Workstation
Hoteling - Workstation			64	4	4	64	256					Workstation
Support Shop			64	1	1	64	64					Workstation
Copy/Supply					1	120	120					
Records Storage					1	200	200					
Archive Record Storage					1	200	200					
Library/Online Resources					1	172	172					Two - 36 sf Workstations and bookshelves
Telecommunication Room					1	100	100					
Kitchenette/Vending					1	375	375					
Break Room			25		1	1,250	1,250					Sized for 40-50 people
Training Room			25		1	500	500					Sized for 15-20 people
Uniform Alcove			1		147	1	147					
Men's Restroom/Shower					1	1,000	1,000					
Men's Locker			7		147	7	1,029					Total Maintenance and Clean Staff within Restroom/Shower
Women's Restroom/Shower					1	500	500					
Women's Locker			7		37	7	257					25% of total Maint. staff; within Restroom/Shower
Gender Neutral Accessible Locker/Shower/Restroom					1	150	150					
Custodial					1	100	100					
Staff & Assignable Area							**7,012**					
Net: Gross (Plus 35%)							**9,467**					
MAINTENANCE ADMIN STAFF				**10**								
MECHANICS				**75**								
TECHNICIANS				**15**								

SECTION 2 - SPACE NEEDS PROGRAM

TABLE 2.E - SPACE NEEDS PROGRAM

FUNCTION	SPACE STANDARD			SCENARIO 2 POTRERO STAFF OR VEHICLES	NUMBER OF SPACES	UNIT SIZE (sf)	SUBTOTAL (sf)					COMMENTS
OPERATIONS												
ADMINISTRATION												
Superintendent			224	1	1	224	224					Private Office
Assistant Superintendent			120	2	2	120	240					Private Office
Operations Supervisor			100	8	1	100	100					1 per 50 operators, huddle space for 4 person meeting. These Operations Supervisors are not included in the Reference Design Concept
Trainer			64	2	2	64	128					Shared Office
Yard Starter Office			120	2	1	120	120					Located at bus exit
Receiver			120	1	1	120	120					Private Office
Dispatch			36	6	4	36	144					Workstation
Administrative Assistant			64	2	2	64	128					Shared Office, Adjacent to Superintendent and Assistant Superintendent
Hoteling - Workstation			64	4	4	64	256					Workstation
Union Office			224	2	1	224	224					Shared Office with 3 workstations
Copy/Supply					1	120	120					
Records Storage					1	400	400					
Uniform Storage					1	80	80					
OPERATORS				**684**								
Operator Check-In					1	500	500					
Kitchenette/Vending					1	600	600					Separated from the Break Room
Break Room					1	2,000	2,000					Access to exterior space via green space on the roof
Lockers			3		714	3	2,142					Locker for all Operation staff
Locker Changing Area					2	36	72					Located adjacent to Operator Lockers
Recreation Area					1	875	875					
TV Room					1	450	450					
Quiet Room					1	500	500					Dividing wall in center of space; one side for sleeping space and one side for quiet space
Telecommunication Room					1	100	100					
Men's Restroom/Shower					1	870	870					Shower to include changing area
Women's Restroom/Shower					1	870	870					Shower to include changing area
Gender Neutral Accessible Locker/Shower/Restroom					1	150	150					
Custodial					1	100	100					
Staff & Assignable Area				714			11,513					
Net: Gross (35%)							15,543					

TABLE 2.E - SPACE NEEDS PROGRAM

FUNCTION	SPACE STANDARD			SCENARIO 2 POTRERO STAFF OR VEHICLES	NUMBER OF SPACES	UNIT SIZE (sf)	SUBTOTAL (sf)					COMMENTS
TRANSIT SERVICES (MRO)												
Operations Manager			120	2	2	120	240					Private Office
Transit Manager II			64	3	3	64	192					Shared Office
Transit Operations Specialist			64	20	8	64	512					Shared Office
MRO, Street Operations			30	160	10	30	300					Workstation
Junior Management Assistant			48	4	4	48	192					Workstation
Conference Room			20	1	1	600	600					Sized for 30 people, dividable with Training Room
Training Room			25	1	1	700	700					Sized for 20 person with component space, dividable with Conference Room
Break Room			15	1	1	300	300					Sized for 20 people
Lockers			7		192	7	1,344					Large lockers with electrical charging
Locker Changing Area					5	36	180					Located adjacent to Lockers
Transit Operations/Equipment Storage/Component Rebuild Assembly					1	200	200					Unconditioned space located adjacent to Transit Services Vehicles for chains, hotsticks, and cones
Telecommunication Room					1	100	100					
Men's Restroom/Shower					1	600	600					
Women's Restroom/Shower					1	600	600					
Gender Neutral Accessible Locker/Shower/Restroom					1	150	150					
Custodial					1	100	100					
Staff & Assignable Area				**192**			**6,310**					
Net: Gross (35%)							**8,519**					

SECTION 2 - SPACE NEEDS PROGRAM

TABLE 2.E - SPACE NEEDS PROGRAM

FUNCTION	SPACE STANDARD			SCENARIO 2 POTRERO STAFF OR VEHICLES	NUMBER OF SPACES	UNIT SIZE (sf)	SUBTOTAL (sf)					COMMENTS
SHARED												
Lobby					1	400	400					
Medium Conference Room			25		2	250	500					Sized for 8-10 people
Large Conference/Small Training			25		2	500	1,000					Sized for 15-20 people
Fitness			80		6	80	480					5-6 pieces of equipment/floor space
Facilities Stationary Engineer Office/Shop				2	2	288	575					These Facilities Stationary Engineers are not included in the Reference Design Concept
Transit Maintenance Engineer				2	2	200	200					These Transit Maintenance Engineers are not included in the Reference Design Concept
Building Maintenance Storage					1	600	600					
Sheet Metal Shop					1	1,400	1,400					
Telecommunication Room					1	100	100					
Main Point of Entry					1	200	200					
Main Telecommunication Room					1	200	200					
Bicycle Parking					1	250	250					Room with hooks, Class 1, ratio in SF planning code
Revenue Office					1	120	120					IT space, workstation, fare box storage; two vaults located outside space
Meet and Greet					1	100	100					At entrance of site
Security Office					1	250	250					
Gender Neutral Accessible Restroom					5	100	500					Adjacent to Security Office and two on each parking level
Trash/Recycling/Compost Compactor					1	600	600					Spread through building and compactors
Hazardous Waste					1	200	200					
Community Room					1	1,200	1,200					
Low Voltage Room Allowance					1	1,000	1,000					Subject to change based on the results of the ongoing electric study for battery electrical buses
Electrical Room Allowance					1	1,500	1,500					Subject to change based on the results of the ongoing electric study for battery electrical buses
Mechanical Room Allowance					1	2,000	2,000					
Emergency Generator					1	500	500					
Lactation Room					1	300	300					
Assignable Area				**4**			**14,175**					
Net: Gross (35%)							**19,136**					

TABLE 2.E - SPACE NEEDS PROGRAM												
				SCENARIO 2 POTRERO								
FUNCTION	SPACE STANDARD			STAFF OR VEHICLES	NUMBER OF SPACES	UNIT SIZE (sf)	SUBTOTAL (sf)					COMMENTS
TRAINING												
Reception					1	120	120					
Manager			224	1	1	224	224					Private Office
Superintendent			224	1	1	224	224					Private Office
Assist Superintendents			120	4	4	120	480					Private Office
Supervisors			64	2	2	64	128					Workstation
Clerical Staff			64	3	3	64	192					Workstation
Team Leader			64	6	6	64	384					Shared Office with storage space
CAT Training			64	2	2	64	128					Shared Office
Instructors			30	43	15	30	450					Shared Office
IT Office			120	1	1	120	120					Private Office
Classroom A			25		1	25	1,250					Sized for 50 People/ Dividable
Classroom B			25		1	25	1,450					Sized for 50 People and components
Classroom C			25		1	25	500					Sized for 20 people
Classroom D			25		1	25	500					Sized for 20 people
Conference Room A			25		1	25	250					Sized for 10 people; dividable
Conference Room B			25		1	25	250					Sized for 10 people; dividable
Simulator Room					3	500	1,500					Sized for three students, one instructor station in each
Computer Lab					1	720	720					Sized for 25 computer stations
Handouts Storage					1	120	120					

TABLE 2.E - SPACE NEEDS PROGRAM

FUNCTION	SPACE STANDARD			STAFF OR VEHICLES	SCENARIO 2 POTRERO NUMBER OF SPACES	UNIT SIZE (sf)	SUBTOTAL (sf)					COMMENTS
TRAINING (CONT.)												
Training Aid Storage					1	800	800					Includes chair and table storage
Uniform Storage					1	120	120					
Records Storage					1	200	200					
Records Archive Storage					1	200	200					
Copy/Supply					1	120	120					
Telecommunication Room					1	100	100					
Kitchenette/Vending					1	200	200					
Breakroom					1	500	500					Sized for 25 people
Operator Locker			3		50	3	150					
Instructor Locker			3		43	3	129					
Lactation Room					1	300	300					
Men's Restroom/Shower					1	570	570					
Women's Restroom/Shower					1	570	570					
Gender Neutral Accessible Locker/Shower/Restroom					1	150	150					
Custodial					1	100	100					
Staff & Assignable Area				**63**			**13,199**					
Net: Gross (35%)							**17,819**					
BUS TOTAL							**479,100**					
VEHICLE CIRCULATION (will vary depending on site configuration, number of levels, and number of ramps required)												

SECTION 3 - DESIGN CRITERIA NARRATIVE

3.0 PURPOSE & INTENT

The purpose of this chapter is to define the goals developed throughout the SFMTA Potrero Yard Planning Study, which includes the reconstruction of the Potrero Yard and the joint development opportunity of non-transit uses above the Bus Yard Component. Guided by planning, compliance, and general site criteria, simple narratives are included to provide an overview of specific systems and assemblies that the Facility requires. The intent of these narratives is to present an easy to understand, non-technical explanation of how this Facility is required to function and includes considerations from the SFMTA employee and stakeholder input.

3.1 Planning Criteria

Table 3.A provides a description of the primary planning, building quality, and transit objectives for the Bus Yard Component.

3.2 Compliance

The Project shall comply with all applicable governing codes and ordinances that regulate building construction, site design, life safety, fire protection, accessibility, energy, and environmental requirements as well as the Project Specific Design Criteria as follows (or those which are applicable at the time the design is initiated). Applicable codes to which the project must adhere are included in Table 3.B.

TABLE 3.A - PLANNING CRITERIA

Design Life	99 years
Quality	The planning, design, and construction of the facility shall be high quality and long-lasting, have the necessary spaces and systems to function well, provide a safe and healthy work environment, and be economical and resource efficient to operate and to maintain.
Planning	The facility layout shall have a logical and efficient organization and flow to allow easy and safe access and circulation for staff, vehicles, and service providers. The layout shall be open and modular with the structure located to support building and equipment loads.
Flexibility	The facility shall be designed to be flexible. Vehicle parking, service, and maintenance spaces shall have an open and modular layout to accommodate 40- and 60-foot motor coaches, trolley buses, and future electric buses. Staff areas shall be designed with an open plan with modular partitions and furnishings that can accommodate staffing and programming needs over time. Training spaces shall be modular co-located spaces with movable partitions to accommodate a wide range of group meeting needs (i.e. one large group, several small groups, etc.)
Space Utilization	The facility shall include all required spaces and assignable square footages (area inside room or boundary) in Section Two of the Facility Program as well as minimum dimensions and clearances as defined in the Space Standards. Bus areas shall be planned to maximize fleet capacity, where possible sharing circulation between functions such as parking and maintenance bays.
Workspace	Workspaces shall be designed based on needs to be highly functional spaces with quality environments that support staff health, safety, and productivity with good day lighting, good ventilation, and durable finishes. If feasible, provide direct access to green space on the roof for employee use and enjoyment.
Safety	The facility shall have the best practice safety features including fire life safety systems; adequate means of egress and way-finding components to exit discharge; fall protection; eye and ear protection; unobstructed circulation and equipment clear space; easy to use fluids collection; and good ventilation with positive pressure in staff areas.
Security	The facility shall have passive and active security. The site shall have limited vehicular and pedestrian entries that are easy to find and visible. The facility shall have card readers at all exterior entries, suite entries, and support spaces. Security camera system shall be installed to monitor all exterior access and interior areas.
Emergency Response	The SFMTA Emergency Response Plan includes emergency transportation after a disaster and then owl service (late night service) plus several additional routes in the first stage of recovery. The number of buses needed during the initial response depends on the disaster. The first stage of recovery requires approximately 250 buses and 680 operators. Please see Section 4.8.1 for more information on the expected resilience and recovery time of Potrero Yard following a major disaster.
Future Electric Buses	The facility shall build in infrastructure for battery-electric buses, using overhead fast-charge in accordance with Refer to Division 5 (Battery-Electric Bus Supplemental Criteria). The trolley bus parking spaces will be transitioned to battery-electric charging spaces over time in accordance with the transition plan approved in the Project Agreement.
Window Cleaning	The facility shall have a window cleaning regime which includes regular use of non-aggressive cleaning products. The use of aggressive or corrosive cleaning products shall be avoided. Regular window cleaning shall happen every 12 months, but not exceeding 18 months, unless undue soiling is apparent in which case the cleaning intervals should be reduced. For the Potrero Facility, the use and contract with a company that specializes in this type of cleaning is required.

SECTION 3 - DESIGN CRITERIA NARRATIVE

The Building Code and Zoning Requirements include, but are not limited to the following. The PPC is solely responsible for compliance with all applicable codes.

TABLE 3.B - BUILDING CODE & ZONING REQUIREMENTS	
Authority Having Jurisdiction:	City and County of San Francisco
Zoning Code:	San Francisco Administrative Code (Planning Code)
Applicable Codes (Adopted):	ASHRAE- 62.1, 90.1, 189.1 California Building Standards Code (with local amendments) California Electrical Code (with local amendments) California Energy Code (with local amendments) California Existing Building Code (with local amendments) California Fire Code (with local amendments) California Green Building Standards Code (with local amendments) California Historical Building Code (with local amendments) California Mechanical Code (with local amendments) California Plumbing Code (with local amendments) California Reference Standards Code (with local amendments) Department of Justice ADA Standards for Accessible Design NFPA Codes- 13, 30, 30A, 33, 88A, 110, 111, 704, 720 San Francisco Code Amendments, State Amendments, Ordinances, and Law
Occupancy Group:	S-2, B, R-2, M
CONSTRUCTION TYPE/ HEIGHT & AREA (SEE ICC TABLE 503; ICC TABLE 504.3)	
Type I-B Max.	150’-0”/ _Floors @_sf ea. Per ICC 2016; 85’ per San Francisco Municipal Code
Fire Protection:	Sprinkler System

[4] The joint development square footages presented in this table are based on preliminary models prepared by the consultant team (The Hatch Team). The ultimate size and form of the joint development component of the project are subject to change.

SECTION 3 - DESIGN CRITERIA NARRATIVE

TABLE 3.B - BUILDING CODE & ZONING REQUIREMENTS (CONT.)

FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS, FOR TYPE 1-B CONSTRUCTION (ICC TABLE 601)	
Structural Frame Including Columns, Joists, & Girders	Supporting Floors - 2 hours Supporting Roof ONLY - 1 hour
Bearing Walls Exterior	(per ICC Table 602) - 2 hours
Bearing Walls Interior	Supporting Floors - 2 hours Supporting Roof ONLY - 1 hour
Non-Bearing Walls & Partitions Exterior	(per ICC Table 602) - 1 hour
Floor Construction Including Supporting Beams & Joists	2 hours
Roof Construction Including Supporting Beams & Joists	2 hours

OCCUPANCY SEPARATION, FIRE BARRIERS, FIRE PARTITIONS, & REQUIRED OPENING PROTECTIVES, FOR TYPE I-B CONSTRUCTION (ICC TABLE 504.3, TABLE 504.4, TABLE 716.5)		
	PARTITIONS	OPENINGS
Occupancy Separation between (S-2, Bus Repair Garage) & (B, Training Area, Operations)	2 hours	
Occupancy Separation between (S-2, Bus Repair Garage) & (R-2, Residential T.O.D.)	2 hours	
Exit Passageways	1 hour	1 hour
Exit Enclosures	1 hour	1 hour
Vertical Shafts (for 14 stories, 144 feet, 0 inch total height)	1 hour	1 hour

INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY (SPRINKLERED BUILDING), FOR TYPE I-B CONSTRUCTION (ICC TABLE 803.11)			
OCCUPANCY GROUP	EXIT ENCLOSURES & EXIT PASSAGEWAYS	CORRIDORS	ROOMS & ENCLOSED SPACES
S-2	Class C	Class C	Class C
B	Class B	Class C	Class C
R-2	Class C	Class C	Class C

SECTION 3 - DESIGN CRITERIA NARRATIVE

3.3 General Site Requirements

There are specific site requirements necessary to ensure safe, efficient, and functional facilities that are outlined (and not limited to) the following:

TABLE 3.C - GENERAL SITE REQUIREMENTS

Facility Accessibility	Provide a minimum of two vehicular entries/exits configured such that either could work as the entry/exit if the other is unavailable.
Facility Lighting	Use appropriate and adequate lighting for day to day operations and to ensure high level of surrounding visibility. Transit facility will have movement around and through the facility at all times of day.
Pedestrian Safety & Accessibility	Observe all code and regulation requirements to insure safe and defined pedestrian circulation paths (necessary striping, bollards, curb cuts, etc.); and that paths minimally intersect fleet ingress and egress. The SFMTA staff have made a number of suggestions to ensure that bus/ pedestrian conflicts are minimized. While beyond the scope of this document, specific design treatments within the right of way to advance this goal include traffic signal pre-emption for buses; separating entrances to the bus facility and joint development to the greatest degree possible; provide transit lanes for buses to connect to OCS; and striping for on-street parking, bicycle facilities, and loading to minimize conflicts with bus movements.
Site Stormwater Drainage	Positive drainage and appropriate stormwater discharge from site and upper exterior/open decks; a stormwater management and pollution prevention plan shall be established. Required per the San Francisco Green Building Code Amendments and GS6 Form for municipal projects and the SFPUC Stormwater Management Ordinance.
Sustainability	Provide as required including the San Francisco Municipal Green Building Code (Environment Code Chapter 7), CALGreen, and the San Francisco Green Building Code. Potrero must be built to a LEED Gold rating.
Parking	(Employee Parking will not be provided)
Security	Provide site video surveillance and building security.
Better Streets	https://sfplanning.org/resource/better-streets-plan
Mission Area Plan	https://generalplan.sfplanning.org/Mission.htm
Mission District Streetscape Plan	https://archives.sfplanning.org/CDG/docs/missionstreets/MDSP_FINAL_DRAFT_OCT2010.pdf https://sfplanning.org/resource/sdat-standard-comments
San Francisco's Biking and Rolling Plan: Active Communities	https://www.sfmta.com/projects/biking-and-rolling-plan

SECTION 3 - DESIGN CRITERIA NARRATIVE

3.4 Sustainability Narrative

Per Table 3.C, the Project must be designed, built, and commissioned in compliance with the San Francisco Municipal Green Building Code (Environment Code Chapter 7) and must achieve a LEED Gold certification (minimum). The following are sustainability strategies that the SFMTA looks favorably on, in addition to all applicable code requirements:

- Innovative and creative storm water management that does not result in square footage loss
- On-site rainwater harvesting and reuse
- Solar panel or other on-site generation
- Commissioning and enhanced energy performance
- Wastewater recycling

In addition, District Utility Systems shall be evaluated as part of the Project's sustainability strategy, so long as a District Utility model could maintain the SFMTA's security and emergency backup power requirements. See Division 4 (*Supplementary Design Criteria)* of the Technical Requirements.

San Francisco Green Code Mandates:

- Indoor water use reduction
- Construction waste management
- Commissioning
- Storm water management
- Energy performance
- Temporary ventilation and IAQ management during construction
- Low-emitting materials (low VOCs)

Cal Green Mandates:

- Light pollution reduction
- No halons in HVAC, refrigeration and/or fire suppression equipment electric vehicle charging.

3.4.1 Materials

Mass walls:

- Structural concrete walls are beneficial for tempering the temperature fluctuations throughout the day. Reduce mechanical cooling during daytime hours and containing/ emitting heat during cold nights.

Construction Materials:

- Select materials and products that minimize resources used, are locally available and produced.
- Use recycled content in all carpet, tile, millwork, and ceiling finishes.
- Use recycled content in all CMU, concrete, and steel structure components.
- During construction phase, divert construction waste from landfill, collect paper, glass, plastic, cardboard, metal, and batteries on site to be recycled.
- Use low VOC emitting paint, coatings, adhesives, flooring, composite wood, and ceiling/wall/thermal/acoustic insulation.
- Use of high fly ash content in concrete
- Use modular furniture systems
- Use certified wood and comply with Chapter 8 of the San Francisco Environment Code.

Proximity:

- Use locally harvested and manufacturer materials.
- Plan for Future Use:
  - ✓ Conduct life cycle cost analysis.
  - ✓ Ensure programmatic functionality.

3.4.2 Water

Indoor Water Use Reduction and Grey Water Treatment:

- In addition to low flow fixtures and rainwater storage, explore the use of gray water treatment and reuse.
- Grey water from lavatories and showers can be treated and used as flush water and/or irrigation water to further reduce the potable water required on site.

Wash Water Recycling System:

- Conserves water and reduces wastewater effluent.

Water Metering:

- Install sub-meters on systems that have the potential for large consumption (vehicle wash system, irrigation, heating and cooling systems, etc.)

3.4.3 Energy Efficiency

Demand Control Ventilation – CO2 Monitoring:

- Provide CO2 sensors to be used in densely populated spaces to eliminate over-ventilation and energy waste.

Air Side Economizers:

- Economizers shall be incorporated with HVAC units to provide free cooling to the spaces when outdoor conditions permit.

Reduce Fan Operating Pressure:

- Select coils and filters with the intent to reduce overall pressure and fan energy. Coils and filters shall be sized for face velocities no greater than 600 fpm. Ductwork pressure drops shall be sized no greater than 0.08 inches wg.

High Efficiency Equipment:
- Selected HVAC equipment shall provide the most efficient heating and cooling for the interior space.

Improved Building Envelope:
- Exterior walls and roof insulation value shall have an (R-value) above CALGreen minimum requirements.

Commissioning:
- Prior to occupancy, HVAC, plumbing, power, and lighting systems shall be commissioned to confirm operation is in accordance with the design intent.

3.4.4 Site/Building

Water:
- Stormwater Management
  - ✓ Pre-treat stormwater water to draw out pollutants, reduce peak flow and recharge groundwater.
- Water Conservation
  - ✓ Apply San Francisco standards and best practices where applicable on the site.
- Rainwater Harvesting
  - ✓ Determine if rainwater harvesting, collection, and reuse is feasible on this site and what size cistern is appropriate.

Vegetation:
- Sustainable Planting Design
  - ✓ Plant trees for shade over paved surfaces to reduce heat island effect. Preserve trees where possible and plant native trees per LEED and San Francisco Bureau of Urban Forestry requirements.

Site Lighting:
- Avoid light pollution by selecting full cutoff fixtures, utilizing LED source for all site lighting, lighting levels in full compliance with IES recommended lighting levels, by taking advantage of the LED drivers' ability for dimming, and occupancy sensors to reduce lighting levels whenever the site is not fully utilized.

Health and Well-being:
- Design for physical activity
  - ✓ Design for physical activity and health of employees workout in the Facility by providing a room and access to planned greenspace.
- Design for optimal social interaction and community engagement.
  - ✓ Provide outdoor and indoor space for employee meals and other activities.
- Wayfinding
  - ✓ Provide clear wayfinding that utilizes multiple best practices to direct employees and the public around the site as appropriate.

Alternative Transportation:
- Ensure unhindered access to public transportation.
- Provide bicycle storage/changing rooms.

Pollution Prevention:
- Create and implement an erosion and sedimentation control (ESC) plan.
- Filter storm water run-off with an oil/water separator.
- Plan for 100 percent on-site storm water detention, if possible.

Noise and Vibration:
- This Facility will be operated year-round, 24 hours a day, 7 davs a week. Proper public nuisance notification and sound abatement needs shall be addressed in the design. Details of the noise and vibration performance criteria are presented in a supplemental document in Division 4 (*Supplementary Design Criteria)* of the Technical Requirements.

Public Right-of-Way Improvements:
- The criteria below require consultation with certain City departments in their regulatory capacity. Reference Appendix I: SDAT Review Letter 1.19.2023 (For Reference).

Curb Extensions (Bulb-Outs):
- Design bulb-outs at each street corner adjacent to the Project Site, if feasible, to slow turning vehicles and shorten crossing distances while allowing buses and emergency vehicles to safely turn without entering into the opposite travel lane.
- Design bulb-out to ensure bulb-outs curb returns are sweepable with standard City street sweeper equipment and don't compromise the street's capacity for conveying stormwater during storm events.

Accessible Curb Ramps and Accessibility Requirements:
- Design accessible pedestrian ramps at all street corners with existing curb ramps at receiving ramps at the opposite end of the crosswalk, including the midblock along Mariposa Street at York Street.

Loading Zones:
- Design appropriate accessible passenger and commercial loading zones based on a loading needs analysis and a loading operations plan regarding both off-street and on-street loading operations.

SECTION 3 - DESIGN CRITERIA NARRATIVE

Street Trees:
- Provide street trees along all frontages but avoid placement of trees within 25 feet of the corner property line on approach to enhance pedestrian visibility and safety.

Street and Pedestrian Lighting:
- Ensure appropriate illumination levels by upgrading existing or installing new street and pedestrian lighting based on photometric studies.
- Orient streetlights to protect night skies and use energy efficient luminaries.

Electrical Transformers:
- Ensure location of transformer room is accessible to the electrical power utility (PG&E and SFPUC) from the public right-of way.
- Ensure location of new underground electrical vaults within the sidewalk does not cause the loss of mature street trees, if feasible.

Waste Collection:
- Locate waste collection areas within the Facility based on a trash loading and removal strategy that has been coordinate and reviewed by the waste collection service provider.

Citywide Bicycle Network / Vision Zero / 17th Street Frontage:
- Provide a safer active transportation route for employees to get to and from the Facility by providing protected bike lanes on each side of 17th Street which is part of the Mission to Peaks Route of the City's Green Connection Network.
- Provide safe access between the Facility and Franklin Square by providing a Rectangular Rapid Flash Beacon in each direction at the crosswalk on 17th Street at Hampshire.

3.4.5 Efficiency and Quality of Operations

Minimum Performance:
- Prohibit smoking in the building and locate designated areas 25 feet from entries to comply with code and enhance employee and visitor health.

Construction Management:
- Protect stored on-site or installed absorptive materials from moisture damage
- Replace all filtration media prior to occupancy
- Perform building flush-out (14,000 or 3,500 cubic feet) prior to occupancy

Low emitting materials:
- Low VOC Adhesives/ sealants, paints, carpet, and composite wood
- Comply with Green seal standard for commercial adhesives
- Anti-corrosive and anti-rust low VOC paints
- No use of urea-formaldehyde resins in laminating adhesives

Plan for Flexibility:
- Include flex shop space.
- Create appealing public and private spaces.
- Circulation shall be function and equipment driven.

Parts Storage System:
- Optimally utilize the volume of space, minimizing the building area footprint.

3.4.6 Electrical

Power Monitoring for Possible Load Shed:
- Service feeder main and all sub-distribution switchboard feeder breakers shall include power digital meters for centralized digital remote monitoring of the building's energy usage for trending analysis and management.

Natural Lighting:
- Daylight harvesting shall be utilized where possible to provide a better working environment by introducing natural light within the work place.

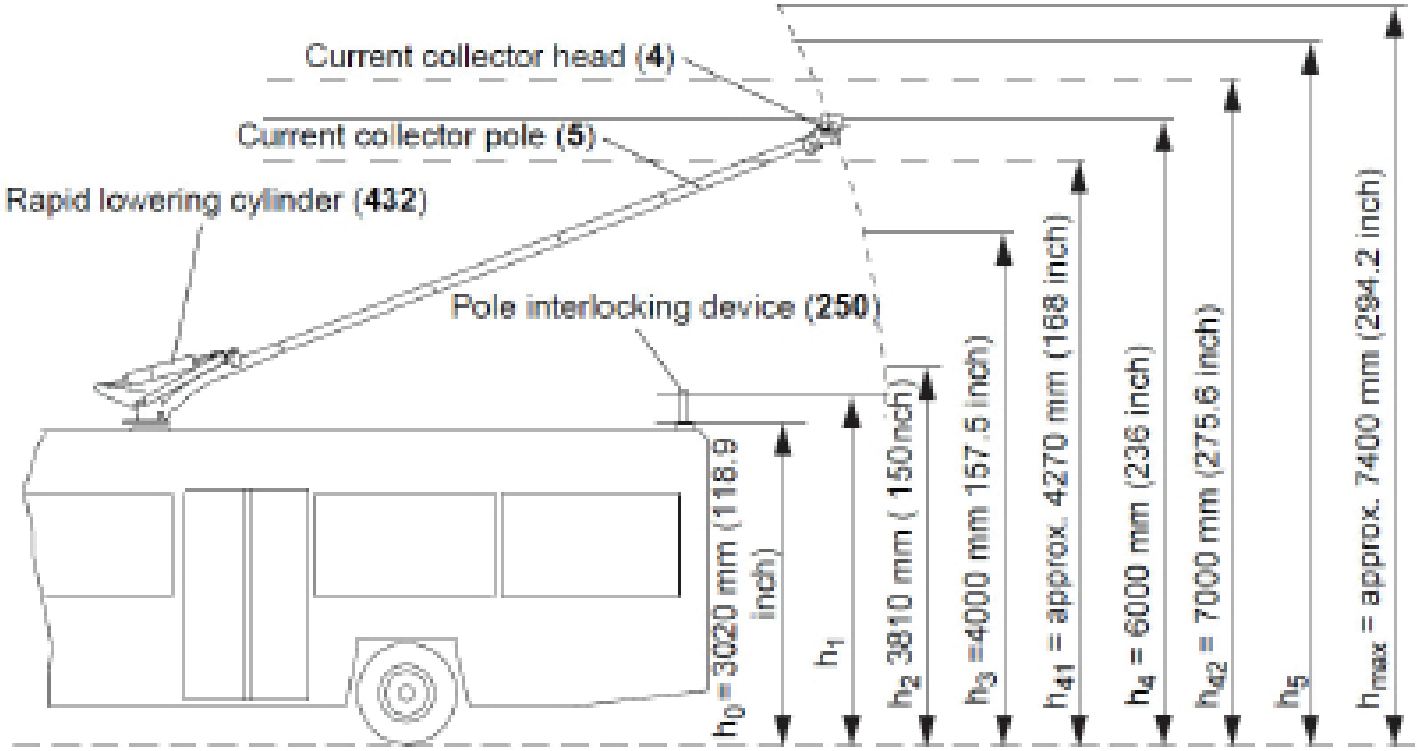
On-Site Generation and Storage:
- Include on-site energy generation and storage where possible, including solar panels and battery systems, to assist in overall building electrical demand and/or backup power.

3.5 Architectural Narrative

The Project will be a mixed-use, joint development consisting of a bus garage and maintenance facility (the Bus Yard Component) and multiple levels of joint development (the Housing and Commercial Component). In addition, the Common Infrastructure is the collection of elements of the Facility that are shared by the Bus Yard and Housing and Commercial Components. The Bus Yard Component is intended to service, maintain, and store a fleet of 40- and 60-foot buses. It consists of a main building that will house separate operations and training facilities, service and inspection bays, bus washes, bus parking, and the associated ancillary and office facilities.

The Potrero Yard bus garage will have three-levels accessible by a scissor express ramp structure for vehicular circulation. Each of the floor plans have areas designated for vehicle parking, service, and maintenance spaces to accommodate 40- and 60-foot trolley buses and future battery electric buses. A bypass ramp at grade will allow buses to enter the facility from Mariposa Street. Provide bypass access to travel directly to the bus parking spaces.

OCS TROLLEY HEIGHT DIAGRAM



SECTION 3 - DESIGN CRITERIA NARRATIVE

The Bus facility shall be designed and future-proofed to enable Paratransit development on the podium roof. The bus ramps shall be extend one additional level to access the transit facility roof. Paratransit vehicles (cutaway buses and vans) will use the same entry, ramps, and exits as the 40- and 60-foot-long buses and non-revenue vehicles should MTA decide to provide Paratransit vehicles. PPC shall design building a structural systems to allow extension of the ramp in the future. Reference Appendix G (Design Criteria Paratransit) for Paratransit program and design requirements.

Pigeon abatement is a major concern. Numerous abatement measures, including bird repellent and spikes, bird wire, bird netting, shock flex tracks, lodge design, bird coils, moving owl, and ultrasonic electric devices can be used.

The new Potrero Yard shall comply with the San Francisco Green Building Code requirements. The building shall meet US Green Council (USGBC) and Leadership in Energy and Environmental Design (LEED) requirements, and obtain GOLD certification. In addition, new construction will have electrical infrastructure capable of supplying electricity for electric vehicle charging at 100 percent of new non-revenue vehicle parking spaces. Refer to Division 5 (*Battery-Electric Bus Supplemental Criteria)* of the Technical Requirements for detailed discussion of BEB power needs.

The materials used in the construction of the Potrero Yard Facility shall be attractive and, durable inside and outside the building, complement the context/environment around the site and neighborhood, and meet the design standards of SF Planning and the San Francisco Arts Commission[5]. Reference the Project Design Guidelines for facade, glazing, etc.

3.6 OCS - Trolley

Poling and de-poling will happen within the Facility per PNC conceptual design in the recent final 100% SD documents. As the trolley buses enter the Facility, they will transition off-wire to navigate through. Once the trolley bus is parked in a bus parking stall, OCS must be provided above for on-wire connection while stored. When leaving the parking stall, the trolley bus will go off-wire again to navigate through the Facility. Once through the exit of the Facility, the trolley bus will connect back to the wire. OCS wire shall also be provided in all repair bays except the preventive maintenance bays for needed power during maintenance. The mechanism for disconnecting from the right-of-way OCS to the facility (pull-in), as well as back onto the right-of-way OCS from the facility (pull-out), shall be carefully considered by the Project Team and proposed through the Bus Facility Technical Proposal.

Shoe replacement will take place just after the trolley bus enters the Facility at the Meet and Greet area. There shall be access to the roof of the vehicles; via a three-axis lift, elevated platform, or any equal means of access for an employee to be able to safely access the shoes on top of the trolley buses.

Appendix B to this document is the SFMTA's OCS Design Criteria document. For this project, the Project Team shall focus on the first section of the document for relevant OCS requirements. Much of the information in the later sections of Appendix B should be interpreted as reference information. See room data sheets for illustration of OCS in applicable spaces. See also the Traction Power section of this document for information on the electrical connection for the trolley OCS network.

Deviation from OCS criteria, such as use of overhead charging pans in the maintenance bays, or non-tension wire in the parking stalls, is acceptable if full functionality is met. This deviation must be considered through the Alternative Technical Concept process. During construction, the Project Team must work closely with the SFMTA's Transit Division to accept all design drawings, and Muni Construction Support for all right of way work and relevant Clearance Permits.

Trolley pole system inspection and maintenance to be conducted in the Preventative Maintenance (PM) Bays. See diagram below and PM Bay room data sheet for requirements.

3.7 Site

The current Potrero Yard, located on a city block bound by Mariposa Street to the south, 17th Street to the north, Hampshire Street to the east, and Bryant Street to the west, sits at the edge of the Mission District and Potrero Hill.

The current site is rectangular in plan and measures approximately 480 feet east to west by 400 feet north to south. On the east side of the site, an approximately 215-foot wide building extends length-ways from the northern site boundary to within 30-feet of the southern boundary. The remaining western portion of the site is occupied by an asphalt and Portland cement concrete (PCC) paved electrified-bus parking area at ground-level.

[5] Please see the adopted Urban Design Guidelines for the City and County of San Francisco at <http://default.sfplanning.org/plans-and-programs/planning-for-the-city/Urban-Design-Guidelines/Urban_Design_Guidelines.pdf>.

The ground-level parking area features numerous ancillary facilities and overhead catenary system (OCS) support poles, guy wires, and live electrical lines. A bus wash station occupies the north central area of the lot and a trash compactor facility occupies the northwest corner of the lot. Access to the ground-level parking area is by an entrance on Mariposa Street.

The ground-level parking area slopes gradually from approximately elevation +54 foot SF-VD13 in the northeast corner to elevation +48 foot SF-VD13 in the southwest corner. The relatively level site has been created by cutting a bench into the natural slope. As a result, along the northern boundary of the site, the elevation of 17th Street is between 10 feet and 23 feet higher than site grade. This difference reduces along the eastern and western boundaries of the site, along Hampshire Street and Bryant Street, respectively, such that Mariposa Street at the southern boundary is at the same grade as the parking area.

The differences in elevation between the site and surrounding streets are accommodated by reinforced concrete retaining walls along the western portion of 17th Street and along Bryant Street, and by integral retaining walls within the building along the eastern portion of 17th Street and along Hampshire Street.

The existing building on the site is predominantly a single-story structure housing a maintenance garage at grade (at Mariposa Street level). The garage area features vehicle service pits for maintenance access to the underside of the buses.

3.8 Structural Narrative

The Potrero Yard project will require several considerations in the appropriate selection of a structural system given, among other things, the long spans of the Bus Yard Component and the load requirements for the Housing and Commercial Component above.

Additional geotechnical investigations by PPC are required to inform PPC's structural design for the Project. For the Reference Concept Design, the SFMTA commissioned ARUP/ RYCG to perform a preliminary geotechnical analysis for the Project.

3.8.1 Structural Summary

This section summarizes the project's structural design standards and outlines the approach for the new structure at the site, with an eye toward earthquake resilience. This approach is developed to provide consistency in design between the existing and new structures throughout the Facility. Items included within this section are Structural design criteria, code analysis, materials, earthquake resilience, and PPC's Geotechnical Baseline Report (see Appendix J).

The concept plan for the rebuild of Potrero Yard involves the demolition of the existing building and all existing utilities serving the existing facilities (including the building, bus wash, and any others) must be demolished, removed, and capped in place unless otherwise noted on the site[6] and the construction of a three-level bus storage and maintenance facility. The maintenance facility will feature vehicle service pits formed by shallow excavations below current site grades and a basement to serve the Facility.

PPC shall accept existing site perimeter retaining walls in their current condition and is responsible for any required due diligence or site investigation required to inform their design and construction. As-built drawings are provided by the City for information only and shall not be relied upon. Shall any existing retaining walls remain in place or be incorporated in the PPC's design, the PPC shall demonstrate suitability and viability of the existing retaining walls and ensure the future design life is commensurate with the new construction.

Design and construction associated with temporary or permanent retaining structures, including the removal, partial re-use or re-use of the existing perimeter walls, shall adequately consider impacts on adjacent property. These include, but are not limited to impacts on:

- Temporary stability
- Temporary street closures and permitting required for proposed works, including impact on MUNI operations
- Buried and overhead utilities
- MUNI lines
- Pavements
- Groundwater levels
- Any other structure, building or utility that may be affected

[6] See Section 4.7.1 for a discussion of the preservation of the façade of the existing Potrero Yard Car House.

Ground movements associated with any basement or retaining structure design, including removal, partial re-use or re-use of the existing walls, shall be evaluated. Impact assessments shall be carried out for all structures, buildings, and utilities within movement zone of influence.

The PPC shall be responsible for obtaining any permits and/or easements necessary to perform work outside of the property line, should this be required to complete the reinforcement and/or reconstruction of perimeter retaining walls.

For the Reference Design Concept, a post-tensioned, cast-in-place concrete beam and slab system with concrete shear walls for resisting lateral loads was considered an appropriate design solution; however, this does not preclude alternative solutions such as structural steel framing. In areas that may be accessible to buses, all columns shall be painted yellow and protected by bollards or other means to minimize the risk of damage from vehicle collisions.

3.8.2 Seismic Resilience

The desired resilience performance criteria for the Facility in the event of a major earthquake is required for the design of its structural system and other building systems. Details of the resilience performance criteria are presented in a supplemental document in Division 4 (*Supplementary Design Criteria)* of the Technical Requirements.

3.8.3 General Structural Approach

The structural design shall be closely coordinated with all other disciplines to ensure that structures perform to their intended purpose over 99 years. The structural design shall incorporate the following principles, in addition to meeting all applicable code requirements:

- Strength: Structures will have adequate strength to support their own weight and the weight of all equipment and vehicles and resist all anticipated gravity and lateral forces.
- Serviceability: Structures will be designed to meet day-to-day user needs and be highly functional over their intended service life. Serviceability considerations include:
  - ✓ Floor stiffness to minimize adverse vibration effects to equipment and floors
  - ✓ Durability of structures to resist effects of temperature variation, weather exposure, shrinkage, in-service use, chemical exposure, and corrosion
  - ✓ Resistance to groundwater infiltration and structure buoyancy in high groundwater conditions
- Load Path: A clear and identifiable load path will be provided for all gravity and lateral forces to be resolved into the foundations.
- Constructability: Structures shall also be designed with consideration given to current construction practices, including items such as:
  - ✓ Placement of formwork
  - ✓ Placement of reinforcing and concrete
  - ✓ Placement of deep foundations, such as driven piles, drilled concrete piers, etc.
  - ✓ Construction joints
  - ✓ Efficient use of materials
  - ✓ Limiting use of field fabrication & welding
  - ✓ Site constraints and existing building structures
  - ✓ Cold and hot weather construction
- Code Compliance: Structures will comply with all applicable codes, as described further into this document.

3.8.4 Foundations

Shallow foundations bearing on the weathered rock in Zone 1[7] may be possible; however, shallow foundations bearing on the near surface Clayey Sand unit in Zones 2, 3, and 4 are ruled out to avoid excessive differential settlement. Deep foundation solutions are therefore required to transfer building loads to the dense sand layer and the underlying weathered rock in these zones. Deep foundation options identified as suitable for this site include:

- Driven steel H-piles
- Continuous flight auger (CFA) piles (also referred to as auger-cast-in-place or auger-pressure grouted piles)
- Concrete-filled steel pipe (CFSP) piles installed with proprietary tips

The length of the deep foundations/piles/piers will vary with the depth rock profile. Additional information about foundation can be found in PPC's Geotechnical Baseline Report.

[7] Please see PPC's Geotechnical Baseline Report for a full explanation of the composition and location of Zones 1-4.

3.8.5 Structural Design Loads

Loads used in the structural design are noted in Table 4.D, except as further defined in the following sub-sections.

3.8.5.1 Load Criteria for Suspended Structure Supporting Buses

To allow for future programming flexibility, the criteria specified in this section shall apply to all suspended floor structures accessible to and having sufficient ceiling heights for buses.

This loading shall apply as a minimum. During the PDA phase, the PPC shall work with SFMTA to confirm the live load criteria that may be specific to the types of buses envisaged in the future for this Facility.

Floor Live Loads for the Bus Yard Component:

- For strength considerations, the vehicle live load cases given in AASHTO shall be used. These load cases shall be applied utilizing ASCE7 load combinations and without AASHTO dynamic impact factors. The live load cases shall include concentrated loads considering the AASHTO design truck. Partition loading need not be combined with these loads.

Deflection shall also be checked under live loading. These checks shall utilize the AASHTO live load configurations for deflections, and shall meet deflection criteria as set out by the California Building Code.

These loads shall not be reduced based on supported tributary area. This applies to floor structure and columns supporting a single floor as well as multiple floors containing buses. Live load reductions may be taken as permitted by the code for other types of live load where a structural component supports those types of load in addition to bus loading.

Seismic Mass:

- Seismic mass for floors supporting buses shall be derived from the weights of structure and permanent non-structural components in addition to a uniform load associated with the weight of empty parked buses. That load shall be taken as 100 psf. Accidental eccentricity of the mass as required by ASCE7 shall also apply to this load.

3.8.5.2 Structural Design Criteria for Podium Lid

The structure supporting the Housing and Commercial Component over the top of the Bus Yard Component is subject to considerations which are unique to this Project. These considerations are described in this section. In this section the structure of the Bus Yard Component is termed the “podium,” and the horizontal structure supporting the Housing and Commercial Component over the Bus Yard Component is termed the “podium lid.” The podium lid is considered to be part of the Common Infrastructure.

Transfer Structures:

- It is likely that the column grids for the Housing and Commercial Component and Bus Yard Component will not fully align, and that transfer structures will be required at the podium lid. The following criteria shall be met for such structures.

Vertical seismic accelerations shall be included in all load combinations involving seismic loading for transfer structures. Vertical seismic accelerations shall be derived from a site-specific vertical response spectrum or from ASCE 7 Section 11.9. The transfer structure shall remain elastic under this loading. Reinforcing steel in concrete transfer structures shall also remain below the yield stress.

Transfer structures that support columns which are part of the lateral force resisting system for the structure above the podium are discouraged. If such transfers are unavoidable, they shall be designed to resist overturning forces based on the capacity of the supported seismic system using expected material properties as defined by ASCE 41, in addition to gravity loading and vertical seismic accelerations. In addition, the flexibility of transfer structures shall be considered in evaluating the seismic behavior of the structure above.

Live load deflection in the residential structure shall include the cumulative deflection due to all live loads supported by the transfer structure, including permitted live load reductions. This deflection shall not exceed ¾” for the building interior and ½” at the building perimeter. Levelness and flatness requirements for floors supported by transfer structures shall consider deflections locked into the structure due to the construction sequence.

Transfer structures shall not support areas which are accessible to buses.

Water-Tightness Considerations:

- For portions of the podium lid that are subject to exterior exposure, special consideration shall be given to water-tightness in order to protect the operations of the Bus Yard Component and the Common Infrastructure. Three levels of protection shall be incorporated: (1) a watertight barrier shall be provided on top of the structure, (2) the structural concrete mix shall be specified for low permeability, and (3) the structural design shall minimize cracking. The latter two requirements are described below in more detail.

The concrete mix design shall incorporate the following requirements:

- ✓ The mix shall be proportioned to meet or exceed requirements for exposure category “W1” as defined by ACI 318.
- ✓ The mix shall have a shrinkage limit of 0.045%. Shrinkage testing shall be conducted on the trial mix and also on field cured specimens extracted from each truck at the point of delivery.

The podium lid structural design shall additionally include the following:

- ✓ Minimum temperature reinforcement area shall be 0.60% of the slab cross section.
- ✓ Spacing of control joints shall not exceed 20 feet. The maximum dimension of a concrete pour shall not exceed 120 feet.
- ✓ Waterstops shall be provided at contraction joints.
- ✓ Crack widths under service loading shall be calculated for the top surface of the slab and shall not exceed 0.012 inches.

SECTION 3 - DESIGN CRITERIA NARRATIVE

TABLE 3.D - STRUCTURAL DESIGN LOADS

LOAD CASE	CRITERIA
Dead	Self-weight of all structures Superimposed dead load due to weight of architectural finishes as well as MEP and fire protection distribution systems (20 psf minimum)
Floor Live Loads	Vehicle Live Loading Per AASHTO including design truck loads(Reference Section 4.8.5.1) MEP or process equipment rooms= 250 psf, or actual equipment weight as dead load if more severe Walkways, Stairs, and Grating = 100 psf All Other Areas = Per governing code Storage Rooms = 150 psf
Dynamic Equipment	Vibration characteristics as specified by manufacturers
Impact Loads	Cranes and Hoists: 25 percent of lifted load Forklifts: 25 percent of wheel loads Crane Lateral Force: 20 percent of lifted load Reciprocating Equipment: 50 percent of total machine weight Crane Longitudinal Force: 10 percent of lifted load Rotating Equipment: 20 percent of total machine weight
Lateral Earth Pressure	As recommended by PPC's Geotechnical Baseline Report for saturated soils
Liquid Densities and Hydrostatic Loads	Water = 62.4 pcf
Wind	Minimum Basic Wind Speed = 95 mph Exposure Category = B Importance Factor, Iw =1.0
Seismic	Site Class C Seismic Design Category D Seismic hazard parameters SDS, SD1: Seismic design parameters shall be confirmed by the Principal Project Company's own geotechnical investigation. Importance Factor, Ie= 1.0 (note additional seismic resiliency requirements per Division 4 of the Technical Requirements) Seismic mass= dead load + 100 psf where accessible to vehicles (see Section 4.8.5.1)
Roof Snow*	Ground Snow Load = Zero
Roof Live	20 psf or 500 lb concentrated, nonconcurrent

SECTION 3 - DESIGN CRITERIA NARRATIVE

3.8.6 Applicable Code & Referenced Standards

The design of structural engineering systems for the Project shall be in accordance with the laws and regulations of the State of California, City and County of San Francisco ordinances, and industry standards, except where more stringent standards are given in this document. In cases where conflicts between the cited documents exist, requirements of the more conservative document will be used.

TABLE 3.E - STRUCTURAL APPLICABLE CODES

Governing Agency	City and County of San Francisco, CA
Agency Contact	https://sfdbi.org/
Adopted Building Code	International Building Code 2015 (IBC 2015)
Loads	ASCE 7-16
Concrete and other structures	ACI 318-14
Specifications for Structural Concrete for Buildings	ACI 301-99
Structural Steel	AISC Manual of Steel Construction, 14th Edition
Specification for Structural Joints Using	ASTM A325 or A490 Bolts
Masonry	ACI 530-08/ ACI 530.1-08
Aluminum	Aluminum Design Manual ADM 1-05
Wood	ANSI/AWC NDS-2015
Light Gauge Steel Framing	AISI D100-08, AISI S1000-07
California Building Standards Commission	California Building Code (CBC), Latest Edition
Code of Standard Practice for Steel Buildings and Bridges Design, Manufacture, and Installation of Concrete Piles	ACI 543R-00

SECTION 3 - DESIGN CRITERIA NARRATIVE

3.9 Mechanical Narrative

General HVAC:

All HVAC design shall be in compliance with applicable codes and standards (including but limited to): California Building, Mechanical and Fire Codes, with local amendments; NFPA 30A, 75, 88A, 90A, 90B and 91; ASHRAE 1, 21, 52.2, 55, 62.1, 90.1, 111, 135 and 189.1.

The use of combustion-fired equipment (including natural gas, liquid propane gas and fuel oil) is strictly prohibited.

Supply, exhaust, and return ducts shall be designed with a maximum of 0.08-inch water gauge static pressure drop per 100 feet of duct. Supply ductwork serving mechanical air conditioning shall be insulated. Exposed ductwork shall be round or oval, uninsulated and suitable for painting.

Transmission mechanisms of SARS-CoV-2 (COVID-19) are not fully understood and there is evidence for an airborne route to be considered, as the virus remains viable in aerosols for at least 3 hours and that mask usage was the best intervention to prevent infection. Heating, Ventilation and Air Conditioning Systems (HVAC) are used as a primary infection disease control measure. However, if not correctly used, they may contribute to the transmission/spreading of airborne diseases as proposed in the past for SARS. Ventilation and filtration provided by heating, ventilating, and air-conditioning systems can reduce the airborne concentration of COVID-19 and thus the risk of transmission through the air. All ducted supply air systems shall be equipped with MERV-8 pre-filter and 4-inch MERV-13 final filter.

Seismic-restraint systems shall comply with CBC requirements. See Section 4.8.1 for seismic resilience requirements.

3.9.1 Mechanical Sustainable Design Systems

Sustainable design requirements and best practices shall be complied with, adopted, and implemented where such requirements are promoted by the United States Green Building Council (USGBC), as defined under the published LEED Standards. The Project must conform to LEED Gold Standards. Code required restrictions placed on the use and quantities of toxic and/or environmentally deleterious substances such as Volatile Organic Compounds, (VOCs), that are components in certain sealants and construction materials, and on the use of HCFC refrigerants in HVAC systems, are specific examples of applicability of such sustainable-based Code design requirements. An energy model will be required based on performance approach to confirm compliance with CALGreen/Title 24 and LEED requirements. LEED credit EAc2 Optimize Energy Performance shall achieve a minimum of 12 points. LEED credit EAc5 Renewable Energy v4.1 shall achieve a minimum of 3 points.

Heating and cooling load calculations for the industrial areas shall be performed in accordance with LEED, CALGreen, and Climate Zone 3. The design of the mechanical ventilation systems, heating systems and cooling systems must comply with the respective requirements of the California Mechanical Code (CMC), ASHRAE Standards of Indoor Air Quality and Thermal Comfort, and CALGreen/Title 24 where applicable.

3.9.2 Operations Areas

The operations portion, as described in the Space Needs Program, any space needed for operators of the Facility shall be climate controlled by heating and air conditioning capabilities. No more than three offices per thermostat. Ventilation shall be in accordance with ASHRAE 62.1. Exhaust fans must be provided for locker rooms, restrooms, kitchen/ break rooms and janitorial areas. A minimum of 1/2 to 1.0 CFM per sf exhaust is recommended for these types of spaces.

3.9.3 Maintenance Parking Areas

Filtered and heated ventilation supply air distribution system, plus exhaust, is required to serve the maintenance and vehicle parking areas. Vehicle maintenance and enclosed parking areas must comply with California Fire Code (CFC), California Mechanical Code (CMC) Table 403.7 and NFPA.

3.9.4 Building Temperature Controls

Direct digital controls (DDC) and Energy Management Control System (EMCS) are required to comply with CalGreen/Title 24, §102.2, Article 4.5.1. All new DDC/EMCS systems must be able to interface with existing Trane BACNet system or Daikin's VRV/VRS controls.

EMCS shall incorporate integrated hardware and software designed to: perform data acquisition, monitor alarms, provide exception reporting, automate controls, and produce historical records of the buildings or the site.

EMCS shall maintain zone comfort, access the system locally (for each building) and centrally (for the entire site, campus, or portfolio) at the same time, to monitor local and remote alarm systems, and provide graphical

system displays, graphical analyses, and energy-use summary reports customized to the facility's operations. In addition, the EMCS shall ensure the operation of each buildings' HVAC, domestic hot water, fire alarm, security and lighting systems. The EMCS shall evaluate the energy characteristics of the HVAC, domestic hot water and lighting system and validate that cost reductions are, in fact, being achieved.

3.10 Plumbing Systems

Domestic and fire protection water shall be provided to the building from a water line extended from the site service connection. A strainer, lead-free reduced pressure backflow and utility grade remote reading water meter must be provided on domestic water lines serving the building. The backflow relief shall discharge outside of the building. Pipe sizing inside of the Facility shall comply with the requirements in the California Plumbing Code (CPC) and a maximum system piping loss to provide a 10 percent pressure safety factor at full system flow. Velocities within any main or branch of the piping shall not exceed 7-feet per second (FPS). Interior domestic water piping above grade will be Type L copper with copper solder- or pressure-sealed joints. All buried domestic water pipe below slab shall be protected with 20 mil polyethylene tape and pipe sleeve at slab penetration.

The supply line to each item of equipment or fixture must be able to be isolated for repair and maintenance without interfering with the operations of other equipment or fixtures. Water hammer arrestors will be in an accessible location on the domestic water piping system where shock pressures could occur. Water hammer arrestors will be PDI-WH 201 certified.

A high efficiency domestic water heating system will be provided with hot water recirculation. Per CALGreen/Title 24 standards, a recirculation pump with timer are required to provide sufficient hot water throughout the facility. A thermostatic mixing valve will be installed on hot water systems. Domestic hot water system to be provided with thermal expansion tank, and re-circulating pump, for hot water return system. All hot water piping shall be insulated. The use of combustion-fired equipment is prohibited. High-efficiency, low-flow plumbing fixtures will be employed throughout the building to meet current CALGreen/Title 24 standards. ADA-compliant electric water coolers and toilet room fixtures will be incorporated.

Water closets will be low flow, vitreous china, siphon jet, 1.28 gallon per flush (GPF) maximum; commercial seat with self-sustaining check hinge. Utilize ultra-low flow vitreous urinals (0.125 GPF).

Lavatories will be under-counter or wall-hung mounting, with deck mounted, hydraulic powered, 0.35 GPM infrared faucets, with sensor under spout.

The floor mounted mop basin will be molded stone with wall-mounted chrome-plated service sink faucet with vacuum breaker; ADA compliant handles with maximum flow rate of 2.0 GPM. Break (coffee) and kitchen area sinks will be stainless steel.

A gravity sanitary lateral will handle all levels, except the basement. The basement will have a sewage ejection system consisting of a sump tank, duplex ejector pumps and pits sized to unit pump to a maximum of six starts per hour. Ejector pumps will be connected to standby power. Sanitary waste will discharge to the street main.

All industrial waste, covered parking, deck drains, and site runoff will drain to an appropriately sized oil/water interceptor prior to connecting to the municipal sanitary system. The storm water system will consist of area drains, roof drains and over-flow drains. Reclaimed water will be used for landscaping at new City facilities, as required per the San Francisco Green Building Code Amendments and GS6 Form for municipal projects.

3.11 Fire Protection Systems

The PPC shall comply with all requirements and criteria (for safety, security, and reliability) to design, furnish, and install a complete and integrated fire protection system. The hazard and coverage requirements for fire protection systems shall be established in conjunction with the City and Authority Having Jurisdiction (AHJ). Provide fire suppression systems in compliance with San Francisco Building Code, San Francisco Fire Code, NFPA 13, 14, 30A, and 88A. Emergency Responder radio signal shall cover the entire Facility, in compliance with the San Francisco fire code. The need for a fire pump will be determined by the fire suppression designed and available fire water pressure in the existing system.

Electric bus technology is rapidly evolving. The battery chemistries that will be deployed in a future battery electric fleet are unknown. The fire risk and corresponding fire suppression strategies for various lithium ion battery chemistries vary greatly. To ensure that robust fire suppression strategies are in place, the design team responsible for the detailed design of the Facility must include a fire protection engineer, licensed in the state of California, with applicable experience. Furthermore, the design team must coordinate with the SFMTA's fleet engineering division to determine the likely

composition of the future battery electric fleet, including battery chemistry, capacity, suppliers, size, and charging stations.

For the Bus Yard Component and the Common Infrastructure, a risk analysis shall be conducted to demonstrate to the satisfaction of the City that the required active and passive fire protection systems can be expected to provide a level of performance equivalent to that envisioned by regulatory requirements. For areas where buses are garaged, the number of buses assumed to be involved in a fire scenario shall be rationally justified. The risk analysis shall include the basis for assumptions about fire growth, fire spread amongst buses, and fire department response time. It shall also consider performance of active and passive fire protection systems with respect to a fire scenario which may exceed traditional material performance testing criteria.

The fire protection experts on the detailed design team will be responsible for devising a robust fire protection system for the Facility that minimizes risk to the Housing and Commercial Component. Their review and recommendations will include, but not be limited to, the location, ventilation, and fire suppression systems for the Bus Yard Component and the Common Infrastructure, as well as for the Housing and Commercial Component. Consistent with California Fire Code, Section 1206.2.11.3, minimum continuous ventilation in battery storage rooms shall be the greater of 1 CFM/SF or 150 CFM, and shall follow any additional guidelines within the California Building Code and California Mechanical Code. Current and potential future EV Charging Areas shall include provision for ventilation compliant with California Building Code Section 1202.2 and California Electrical Code Section 625.29. This requires ventilation by parking space based on the type of charger serving the location. Ventilation requires proper supply and exhaust, which can be achieved through active supply ventilation or direct outdoor exhaust with passive intake.

The final design of the fire protection system shall be completed by a C-16 licensed fire protection contractor based on design criteria developed by the Principal Project Company's Fire Protection Engineer. The design criteria shall be informed by the risk analysis referred to above and by regulatory requirements. The system shall be hydraulically calculated. Sprinkler system occupancy hazard classification, minimum density and maximum sprinkler spacing and standpipe requirements shall be determined in concert with the AHJ. Street hydrant flow test data will need to be determined during the PDA phase.

3.12 Electrical

3.12.1 Systems Overview

Basic electrical systems requirements for the Project include powering the mechanical systems, maintenance equipment, convenience receptacle power, interior and exterior lighting systems with controls, an addressable fire alarm system and to provide power to other utilization pieces of equipment through the Facility.

The electrical distribution system shall be set up to allow for charging of the future electric bus fleet and all electric non-revenue vehicles as shown in Table 2.E of Section 2 in the Space Needs Program.

3.12.2 General Facility Requirements

As a municipal City department, the SFMTA partners with the San Francisco Public Utilities Commission (SFPUC) as electrical provider. The SFPUC operates Hetch Hetchy Power, a Publicly Owned Utility. The SFPUC relies upon PG&E's transmission and distribution grid to serve its customers, for which PG&E receives a fee. This situation, with the lack of designated service territory boundaries between the two utilities, is unlike any other in the country, and greatly limits the SFPUC's visibility into PG&E's grid infrastructure and capacities. PG&E does not provide feeder capacities unless the SFPUC applies for service through the Wholesale Distribution Tariff (WDT), a costly process that requires up to three years for PG&E to perform a System Impact Study to determine the available new load capacity.

Under the WDT, each SFPUC customer inter-tie point is viewed by PG&E as a utility-to-utility connection. As such, PG&E applies the rules of the WDT to each SFPUC customer connection. Upon completion of the review, any grid or infrastructure upgrades required by PG&E are borne solely by the SFPUC customer.

In March 2021, SFMTA submitted two Wholesale Distribution Tariff (WDT) electrical service applications to the SFPUC. The first application ("Feeder 1") focused on the industrial uses intended for battery electric bus (BEB) charging loads, and the second application ("Feeder 2") focused on the mixed-use housing and retail loads and remaining BEB loads. Both applications and supporting materials were based on a total projected load predicated on the RDC. These two original electrical service applications are attached to this DCD in Appendix C, for reference.

In March 2023, PG&E issued to the project a System Impact Study (SIS) report in response to each of the two WDT service applications. In the time since the original applications were submitted in March 2021 and the SIS reports were issued, SFMTA has determined that the

transition to BEBs at the Potrero Yard Facility will be deferred to a later date no sooner than 2040 (reference Division 5 Battery-Electric Bus Supplemental Criteria). As a result, the project will proceed DocuSign Envelope ID: 580479DF-30FF-46C3-8388-378A8FFFEE7A with one electrical service application for mixed-use that will serve all Project load demands required for the Bus Yard Component, Joint Development Alternative 1 Housing and Commercial Component, Joint Development Alternative 2 Paratransit Component, and Common Infrastructure (reference Division 1 General Provisions, Project Description).

The SIS report for the mixed-use service application is attached to this DCD in Appendix, for reference. While this SIS report reflects an assumed maximum net electrical load demand to be 7.8MW, PPC shall work with PG&E to ensure that the new electrical service enabled through the mixed-use service application provides for the total load demand for the Project and all of its components. To this end, PPC shall ensure that the total load demand for the Project falls within a capacity of 11MW as delivered through this new electrical service.

In the context of all Project load demands being served by one single 11MW electrical service, PPC shall implement the electrical system for the Bus Yard Component in anticipation of Joint Development Alternative 1 Housing and Commercial Component or Joint Development Alternative 2 Paratransit Component developed in future phases and not concurrent with the design and construction of the Bus Yard Component. Implementation of the electrical service infrastructure serving the Bus Yard Component shall be performed in a way that reasonably facilitates and is compatible with future construction phases to design and build Joint Development Alternative 1 Housing and Commercial Component of Joint Development Alternative 2 Paratransit Component.

PPC shall make provisions for the portion of the total 11MW electrical service that provides DC traction power to the electric trolley buses to be able to be completely isolated from the rest of the Infrastructure Facility electrical distribution, so that SFMTA maintains operations, maintenance, metering, and functionality, with the ability to monitor, isolate, or de-energize at their sole discretion. Reference section 3.12.3 through 3.12.6 in the DCD for further explanation of salvaging and reconnecting the existing traction power feeder B-3 to power the electric trolley fleet in the new Facility.

The SIS report in Appendix H describes the anticipated off-site utility improvements required to be performed. PPC shall perform all work (design, traffic control, demolition, excavation, shoring, trenching, coordination with PG&E construction crews and inspectors, install new / modify existing utility vaults, install conduit, install new duct banks, soil and debris off haul, backfill, paving, sidewalk restoration) and obtain the necessary permits to enable PG&E's design provided in the final Service Agreement. PPC's scope of work will be finalized once PG&E produces and transmits the final service agreement to the project.

Power for the Facility will be 480V/277V, 3 phase, 4 wire, with solid neutral. All equipment with a large electrical load will be served at the highest voltage possible, 480V, 3 phase[8]. A transformer will step down the voltage to 480V.

Power requirements for battery-electric bus charging infrastructure are included in Division 5 (*Battery-Electric Bus Supplemental Criteria)* of the Technical Requirements. The main electrical room shall be designed to accommodate switchgear and associated electrical equipment to handle the future BEB fleet charging.

The electrical distribution system will be segregated by the type of load; life safety, critical emergency, and optional emergency power loads. Loads shall also be separated by lighting, industrial, receptacle, and mechanical equipment. Provisions to monitor these load through meters shall not be initially installed; however, the design shall allow their installation in the future. An ATS shall be provided for each of the emergency systems provided for the facility. ATS's shall be provided with programmable testing, generator start-up, and connected to a building information system to monitor the status of the emergency system.

CALGreen receptacle control will be achieved by tying receptacle control devices into the lighting system control panel. The Lighting System occupancy sensors will be utilized to turn off 50 percent of the receptacles within a room when the room is not occupied.

Electrical charging for non-revenue vehicles shall be installed in compliance with Department of Building Inspection Form GS6: San Francisco Green Building Submittal Form for Municipal Projects. Initial panel boards in the vicinity of non-revenue vehicle parking, shall be provided with 20 % 40 Amp, 208V single phase spaces for future EV charging stations. Panelboard serving EV charging

[8] See Appendix C and Division 5 Battery-Electric Bus Supplemental Criteria for power needs for BEB fleet infrastructure.

shall be a minimum 225 amp bussed with a calculated demand load that will allow the future EV loading to be added to the panelboard. EV charging stations shall be installed per SF Environment Code requirements.

3.12.3 SFMTA Traction Power Network

The SFMTA's traction power network is comprised of 28 substations and 45 independent feeds, which together deliver Direct Current (DC) traction power to about 500 route miles of overhead catenary system and serve 3 different modes (electric trolley buses, historic streetcars, and light rail trains). The network delivers DC traction power at a nominal voltage of 650 VDC, and the SFMTA electric trolley bus vehicles are suited to run on that system. The total capacity of the traction power network is approximately 180 MW. The SFMTA's utility provider to this network is PG&E.

SFMTA electric power distribution network connects the DC output from various substations through power cables routed in underground duct banks to the overhead contact system.

3.12.4 Potrero Yard Traction Power System

The electric trolley buses at Potrero Yard are fed from the Bryant Street substation. One feeder circuit (Feeder B-3) is reserved specifically for electric trolley buses in the yard, and another feeder circuit (Feeder B-7) powers the OCS right-of-way ROW around the yard for service adjustments and transitions. The overall power system feeder diagram and individual diagrams for the on-site feeder and the feeder that circles the right-of-way of the yard are attached and can be found in Appendix D of this Design Criteria Document.

The SFMTA requires that the traction power system be safely disconnected when the yard is demolished and that the new facility Facility be reconnected to the traction power system to serve the overhead catenary powering and charging the vehicles in the yard and supporting the transition to revenue service in the right-of-way. This section provides relevant information to support that process.

Potrero yard will be expanding the number of electric trolley buses (ETB) stored there as a result of the delayed transition to a full replacement of ETB with battery charging electric buses. To accommodate this change and to ensure reliable power availability in the yard, electrical capacity to power the expanded ETB fleet will be provided by a combination of the reconnected and reconfigured existing traction power Feeder B-3 and utilizing a portion of the new 11 MW electrical service to be delivered through the WDT electrical service application process.The traction power distribution to be provided by the combination of this new traction power feeder distributed from the new 11 MW electric service and the existing Feeder B-3 shall be designed and installed so that the electric trolley bus load is divided approximately equally among these two power source feeders. Each feeder section shall be spatially continuous to minimize interface between the two feeder sections and to minimize areas that would require both feeders to have power switched off and be grounded in order to be made safe. A load rated disconnect switch shall be provided to allow for connection or isolation of the B-3 feeder and the new traction power feeder.

Similar to the new traction power feeder, PPC shall make provisions for the reconnected and reconfigured Feeder B-3 to be able to be completely isolated from the rest of the Infrastructure Facility electrical distribution, so that SFMTA maintains operations, maintenance, metering, and functionality, with the ability to monitor, isolate, or de-energize at their sole discretion.

Appendix F contains security sensitive information that must follow the required processes and procedures set forth in Appendix F, for access to traction power related specifications.

3.12.5 Isolating and Disconnecting the Traction Power System for Demolition

Within the yard boundary, specifically for the feed serving the yard, the process for disconnecting the traction power feed is straightforward because the feeder circuit is dedicated to the yard. Standard process to rack out and lock the feeder, verify de-energization, and place protective ground is required. The PPC shall coordinate closely with the SFMTA on this process.

For work in the right-of-way around the yard, the circuit is a lot more widespread and will require a local isolation. Right-of-way work requires close coordination with the SFMTA. PPC shall submit each phase of design drawings for SFMTA review.

PPC is responsible for designing and performing all traction power disconnection and reconnection procedures, in close coordination with the SFMTA.

3.12.6 Reconnecting the Traction Power System to Serve the Trolley Bus Fleet

Upon completion of the Facility, the trolley bus charging function and all transitions to revenue service (navigating from Mariposa Street into the Project Site) must return to the SFMTA traction power system practice. This

will require close coordination with the SFMTA to ensure a seamless reconnection. The electrical design and built connection must be accepted by the SFMTA to confirm that it meets SFMTA specifications before plugging into new system. To design the reconnection, the PPC shall use the feeder map shown in Appendix D to understand how electricity is currently distributed through the yard. PPC shall follow all California General Orders and references pertaining to electrical utilities, including, but not limited to the list contained in Appendix B: SFMTA OCS Design Criteria.

3.12.7 Existing Traction Power Circuit Condition and New Traction Power Circuit Cable Path

The existing traction power distribution circuit servicing Potrero Yard from the Bryant Street Substation is approximately 40 years old. Once SFMTA completes the initial study as described in section 3.12.4, the City will inform the PPC regarding any further site due diligence expected to be performed jointly between the PPC and the SFMTA.

3.12.8 Battery Electric Fleet Requirements

The California Air Resources Board Innovative Clean Transit legislation requires all bus public transit fleets in California to convert to clean energy propulsion by 2040. The SFMTA has made an organizational decision to replace our Hybrid Electric and Trolley Electric Buses with BEBs. BEB charging infrastructure is required at Potrero Yard. BEB design requirements and standards are described in Division 5 (*Battery-Electric Bus Supplemental Criteria)* of the Technical Requirements.

Charging infrastructure for the battery-electric buses at the Potrero Facility will be required once the SFMTA transitions from trolley buses. The Potrero Facility shall be designed to enable a fluid, efficient transition. Trolley buses require an overhead line affixed in some way above the parking lanes. The SFMTA will leave the design solution to the PPC, and requires that the overhead infrastructure for the trolley bus parking spaces shall be designed to ensure seamless transition from the trolley buses to battery electric buses.

Performance standards and acceptance criteria for charging modules/equipment are described in the E-Bus Performance Requirements Documents. The bus charging solution shall be fed at 480V, 3-phase. The intent is to power multiple units using a single charging cabinet. To facilitate the transition to a battery electric fleet, all bus charging feeders will be run above grade in the ceiling structure or overhead/mezzanine space. Bollards and other physical barriers shall be placed to protect any ground-mounted charging infrastructure.

The facility's overall power requirement shall accommodate a full yard of Battery Electric Buses (213 bus capacity). The final orientation and fleet organization shall be confirmed with the SFMTA at the PDA phase. All battery-electric bus switchgear/equipment shall be provided within the main electrical room. Any power or equipment that cannot be provided due to utility provider requirements must be accounted for in transition planning documents and have adequate space reserved and identified in the main electrical room.

3.12.9 Battery Electric Bus Transition

When Potrero Yard fully transitions to battery-electric bus, the battery-electric bus parking lanes and associated infrastructure shall be designed to transition to the new electrical service connection for the building. When this occurs, the traction power feeder to the yard shall again be deenergized. The Principal Project Company (PPC) may consider reuse of the traction power feeder to provide enhanced emergency backup power, or another building purpose following replacement of the trolley bus fleet with battery-electric buses. The SFMTA will also begin a process in earnest in the coming years to consider the full decommissioning of the trolley bus OCS system, including how the traction power system could be safely repurposed.

3.12.10 Fire Alarm System

A fully addressable fire alarm system shall be provided for the Facility. The fire alarm system shall contain sufficient activation devices (i.e., pull stations, smoke detectors, heat detectors, UV/IR detectors, etc.) as required by Code and additional detection necessary to achieve the overall fire safety goals. It shall monitor the building's sprinkler system and provide occupant notification in the case of a fire event. Premise monitoring shall be provided by an off-site entity in accordance with NFPA 72.

3.12.11 Lighting

Interior Lighting:

Lighting systems for the Facility shall utilize LED light sources with dimmable drivers. Daylight harvesting shall be utilized wherever practical. Daylight sensors shall be installed to allow the dimming of the LED lights when there is enough natural daylight within the space. Occupancy and vacancy sensors will be incorporated into a low voltage lighting control system for all interior and exterior lighting systems. All offices and small rooms shall be provided with occupancy sensor(s) as required for full room coverage. The Facility's lighting control shall operate on the following properties:

- An addressable lighting control system shall be provided. The system shall be programmed with normal building operational hours and

shall turn the lights on and off in compliance with the hours of operation.

- All regularly occupied spaces such as offices shall be provided with vacancy sensors. All other spaces such as bathrooms, janitor closets, back of house shall be provided with occupancy sensors. All sensors shall turn off the lights after 5 minutes of no occupancy.
- All areas with natural daylight shall be provided with daylight harvesting. Once the sensor picks up enough daylight within a space the lighting control system shall dim the LED luminaries. The luminaries shall be dimmed to a minimum level of 10 percent while maintaining design fc levels.

Exterior Lighting:

Site lighting fixtures will be an LED light source with a dimmable driver. The fixtures will be controlled by a programmable low voltage lighting control panel. Luminaries shall be provided with occupancy sensors. The required control of the exterior lighting shall be:

- An addressable lighting control system shall be provided. The lighting control system shall contain an astronomical time clock and input from a photo sensor. The lighting control system will turn on the lights at dusk so that the lights are on at the start of the normal parking lot hours. The lighting control system shall turn the lights off at either the scheduled time, or dawn (whichever is first).
- After 11:00 PM the luminaries shall reduce to 25 percent light output. If a luminaire senses motion, that luminaries shall increase brightness to full bright. After 10 minutes of no motion the luminaries shall drop back down to 25 percent.
- All staff entrances and exits should have pedestrian level lighting for staff circulation safety.

3.12.12 Emergency Power

The Bus Yard Component and the Common Infrastructure shall be provided with an emergency generator which will allow the Facility to operate for 24 hours, at limited capacity in the event of a power outage or emergency. The emergency generator must be designed to provide power to Life Safety Loads, Critical Electrical Loads, and Additional Emergency Loads. In addition to this Section, refer to Section 3.8.1 for the resilience and recovery requirements for the Facility, and to Division 5 (*Battery-Electric Bus Supplemental Criteria)* of the Technical Requirements for emergency power requirements related to BEB fleet resiliency.

Generators shall be designed and installed to meet all applicable codes.

The following list of items must be on emergency power (NFPA 110 requirement included):

Life Safety Loads:

- Pathway egress lighting
- Exit lighting
- Fire alarm systems
- Other loads to ensure human life safety

Critical Electrical Loads:

- IT/Data rooms and systems
- Security systems
- Communications systems
- HVAC equipment serving these spaces
- HVAC control system
- Elevator(s)
- Fume ventilation systems

Additional Emergency Loads:

- Automatic garage door openers at entrance and exits of the facility.
- Four maintenance bays- SFMTA with the assistance of the PPC to specify which during the PDA phase.

Diesel generators are assumed to be the base case for design and pricing purposes and are a reliable mode of backup power generation but are inconsistent with long-term decarbonization goals for the City of San Francisco and State of California, and create space, maintenance, and hazard impacts for the site.

There are lift safety loads on the generator; the Life Safety Code and NEC requires an uninterruptible fuel source for the generator. Permission is required by local AHJ to verify the generator is uninterruptible.

3.12.13 Electrical Communications

Electronic Communications System Overview:

Communications systems shall include a Structured Cable System, Public Address (PA) System, and a Telecommunications Grounding Connection. The general systems and basic operations of the communications system are covered in this section.

Governing Codes:

California Electrical Code (CEC) provides minimum safety requirements for these systems. Design and installation shall be based on the CEC, BICSI, and IT best practice and manufacturer's recommendations. Structured Cable System pathways shall be based on current telecommunications performance standards.

Public Address (PA) System:

Amplifiers and speakers shall be provided throughout the Facility and will be accessed through the telephone system or dedicated microphone. PA speakers must be strategically placed within the Facility allowing the PA system to provide uniform sound coverage for all PA announcements.

Structured Cable System:

Structured Cable System pathways will be provided for City-provided equipment including, but not limited to: wireless access points (full building coverage), administrative workstations, shop workstations, and fuel stations.

IT space requirements depend on total number and sizes of the workspaces. See Table 3.G for workspace details.

General industry standards shall be followed for wiring and wiring runs. Category 6 cables generally cannot be longer than 100 meters.

TABLE 3.G - NETWORK CABLES

NETWORK CABLE (QTY.)	19" RACKS	SPACE NEEDED
0 - 100	Half rack	3' x 3'
0 - 300	1	10' x 6'
301 - 600	2	10' x 8'
601 - 900	3	10' x 10'
901 - 1200	4	10' x 12'
1200 - 1500	5	10' x 15'

Telecommunications Rooms:

The Bus Yard Component and the Common Infrastructure shall have a Main Telecommunications Room (MTC) for the Main Distribution Frame (MDF), security equipment, routers, core switches, and servers. Provide two four inch conduits to the MTC from the Main Point of Entry (MPOE) to facilitate current program and future growth. The MTC shall include two to four empty network racks for potential equipment. Telecommunications Rooms shall be provided as required to provide connectivity and house the Intermediate Distribution Frame (IDF) for all work stations. TC rooms shall have two-inch conduit paths back to the MTC. All rooms shall be designed for future expansion and be equipped with equipment racks and cable management systems for organized and efficient cable routing. A 48-strand fiber optic cable (single mode) running from MTC to TCs is required.

Grounding System:

A telecommunications grounding will be implemented to protect telecommunications equipment. The telecommunications grounding system shall be connected to the Electrical Safety Grounding System.

3.12.14 Electrical - Security

Electronic Security Systems Overview:

Security Systems include a Video Surveillance System (VSS), and an Access Control System. Security system devices shall be strategically placed throughout the Facility based on the SFMTA input during the PDA phase, best practice, and industry standards.

Governing Codes:

The CEC provides minimum safety rules for these systems. Design and installation shall be based on the minimum CEC requirements, best practices, and manufacturer's recommendations. Physical separation between the Bus Yard Component and the Housing and Commercial Component shall be provided to limit access and decrease the security threat to either.

Systems Monitoring:

Security Systems will be monitored from the operations or general manager office with exact locations to be determined during the PDA phase. Bus Yard Component will provide cameras and monitoring for the bus yard major entrance and exits. The Housing Components will provide cameras and monitoring for the housing major entrance and exits. Off-site monitoring is a minimum requirement.

Video Surveillance System (VSS):

The PPC shall use a SFMTA approved VSS system that interface with our network software, etc. and to provide real time recording of critical areas and the parking areas. Strategically located cameras will be required in designated areas for video monitoring and recording for forensic use. At a minimum, all entrances and exits shall be covered. The cameras shall be IP based (minimum 1080P) and compatible with the SFMTA standards. Camera selection and placement will be determined during the PDA phase in consultation with the SFMTA. Required camera placement and field of view shall be shown on the floorplans. The SFMTA expects that available camera models may improve by the time construction is completed and therefore will do a final review of the camera selection and supporting infrastructure prior to their ordering and installation. The SFMTA maintains a list of approved camera models that have been tested and are approved. The SFMTA will review the VSS halfway through the design.

Access Control System:

A card access system shall be provided that is compatible with the existing SFMTA system to allow access to the site gates, building staff entry, and critical areas.

The existing SFMTA access control system works as follows. Each SFMTA employee has an access card that is encrypted with a facility code and card number. This information is programmed into a Honeywell ProWatch Data Base by an SFMTA Administrator. The card is then waived in front of a card reader at a door, elevator, or any other location that requires a card reader for access. The card reader reads the information from the access card, and if the employee has access, the door or elevator will open or operate as normal. The door and card reader have wires running to it from the Access Panel usually installed in the IDF closet. The Panel then is tied into the SFMTA network. The power supply is tied into the access panel, and the panel has a relay that pulses the power supply when it receives a positive card read.

Building Access Doors:

Entrance into the Bus Yard Component through building doors and at all emergency egress routes that may be shared with the Housing and Commercial Component shall be controlled by a card reader system. When a valid RFID card is presented to the local card reader at the door, the lock will be opened, allowing ingress. Entrance gates shall also be capable of functioning on a schedule. For example, gates for bus and delivery entry may be left open during business hours for free ingress/egress, but after-hours ingress may be controlled by the card reader system.

Intercom System:

The Facility shall be equipped with an intercom system consisting of two-way intercom stations located at locations to be determined during the PDA phase in consultation with the SFMTA. The intercom system shall be IP based and must be compatible with existing SFMTA standards. The intercom system shall be interoperable with the access control system as ingress or egress requests can be made from an intercom station.

TABLE 3.H - RECIPROCATING VS. ROTARY SCREW AIR COMPRESSORS

RECIPROCATING	ROTARY SCREW
Cost advantage as single-acting, air cooled unit below 30 HP	Used more in 150 PSIG, lubricated air systems above 30 HP
Double-acting units used in 175 PSIG and in non-lubricated applications	Used for constant volume, variable pressure applications
Normally used for heavy duty, continuous service	Oil or water is used for sealing and cooling
High overall efficiency	Must vent reservoir to lower power consumption when unloaded
Operates efficiently at partial loads	Delivers high air volume in a compact space
Saves horsepower under no-load conditions	Smooth pulse-free output
High maintenance costs	Easy to install and maintain
Requires heavy (concrete) housekeeping pad	Low vibration

Uninterruptible Power Supply (UPS) System:

A UPS system shall be provided for security electronics to allow security electronics, network equipment, and phone system to maintain function in the event of a power interruption.This system is on emergency generator power system and a rack mounted UPS with 15 to 30 minute battery back-up for system ride through during power outage events shall be provided. Determine during PDA phase with consultation with SFMTA. Other customized IT systems such as Radio, Computer Aired Dispatching, Fleet Watch, and others shall be addressed in detailed design in coordination with the SFMTA.

3.13 Solid Waste Disposal

A single consolidated location for the Bus Yard Component is required in the basement for recycling, composting, and landfill waste. Waste shall be delivered to receptacles through trash chutes running from the Bus Yard Component to the basement. The trash facilities shall include a 30-yard recycling compactor. The basement shall be fully accessible to garbage collection vehicles. The trash area shall be well lit and ventilated to avoid noxious smells. The drawing package shows approximate location for waste area, final sizing, design, and equipment will be determined during detail final design. The waste area must be compliant with Chapter 19 of the Environment Code and the City and County of San Francisco.

This section of the code deals with waste disposal, the three waste streams (recycling, landfill, composting), and compliance monitoring.

3.14 Compressed Air and Lubrication Distribution Equipment

The compressed air and lubrication distribution systems are two important aspects of a facility that provide ease of use for the mechanics working in a multi-bay facility. The compressed air and lubrication piping will need to be sized properly to support the shop equipment throughout the facility. The lubrication equipment needs to support the vehicles being serviced for the facility to be most efficient. Table 3.H provides comparison details for reciprocating and rotary screw compressors.

There are several factors to be considered in the appropriate compressed air and lubrication system selection including (but not limited to):

- Number of bays
- Lubrication fluids needed at each location
- Length of longest piping run
- Monitoring technology

Rotary Screw Compressors:

These types of compressors use two rotors or helical screws to compress air to produce compressed air. Rotary screw compressors are quieter than piston units, allowing a quieter work environment while operating relatively energy-efficiently. Operating temperatures are at least 100 degrees F cooler than piston units, resulting in longer life. Rotary screw compressors are most efficient when in constant operation because they require approximately six minutes to ramp down from compression duty. During this time, the compressor is not fully loaded but still requires some amount of power input that does not produce any compressed air.

However, the amount of time required to ramp down from compression duty will be reduced to about 20 seconds when the unit is operated by a variable frequency drive (VFD).

The maintenance (long-term) cost of a rotary screw compressor is one major drawback because the more complex equipment with electronic components requires more regular maintenance compared to piston-type compressors. However, because screw-type compressors do not operate with as much friction as piston-type compressors, the frequency of maintenance is significantly less than piston-type compressors.

Reciprocating Piston Compressors:

Piston compressors are typically used for general-purpose applications such as workshop/air, where the air is used for hand-tools, cleaning dust, small paint jobs, etc. It is one of the most commonly used compressor types. Piston compressor are available from 1 HP to about 50 HP. The motors can be duplicated (duplex) in effort to double the power output (horsepower) and can then be configured in a lead-lag operation to ensure equal wear on the motors.

Piston compressors are more economical below 30 HP and work well in maintenance shops as they are more suitable for high pressure (175 PSIG or more) applications.

Piston-type compressors have a simple design and can be more easily fixed by facility maintenance staff compared to a screw-type compressor.

There are a few drawbacks to piston compressors such as excessive noise, high outlet temperature, and high oil content in air piping. These can all be mitigated through engineering a system appropriately.

Refrigerated Air Dryers:

An air dryer is an integral piece in compressed air treatment system. Air quality can have a significant impact on compressed air tools and equipment. Properly treated compressed air, and the right air dryer, will improve productivity, system efficiency, and product or process quality. Refrigerated air dryers are specifically designed to handle the high discharge temperatures of piston compressors. The purpose of using a refrigerated air dryer is to remove entrained moisture in the air to prevent corrosion in air tools with moving steel parts. Refrigerated dryers typically provide dew points of 40 degrees F at rated conditions.

A few filters are required to be used in compressed air systems. The particulate air filter is downstream of the compressor and upstream of the dryer. This type of filter removes any dust or particulates in the air. The second filter located downstream from the dryer is the coalescing air filter, which removes the excess oil and water left in the air by the compressor and the dryer.

Desiccant Air Dryers:

These types of air dryers do not require power to dry the air, as is the case with refrigerated air dryers. These types of dryers utilize a filter that captures the entrained moisture in the compressed air. Desiccant dryers trap so much of the moisture from the air that they typically reduce the dew point temperature to -40 degrees F.

Compressed Air Receivers/Tanks:

Air receivers are pressure vessels that store treated or untreated compressed air. The air stored in these vessels alleviates the frequency of starts required by the compressor whenever compressed air is used. Some reciprocating

and rotary screw compressors can be mounted on an air receiver, but some are base/floor-mounted.

Bulk Fluid Storage Tanks:

Bulk Storage Tanks allow facilities to store large quantities of fluids while meeting required codes with double wall containment. Tanks can be monitored to promote more efficient product inventory control and throughput data. Tanks are available in sizes from 100 gallons to 50,000 gallons based on the frequency that the facility wishes to receive fluid deliveries. These tanks can also be utilized for waste/used fluids such as used oil and used coolant. Tanks are typically stored in a central location along an exterior wall for reduced piping lengths and ease of delivery and extraction of bulk fluids.

The amount of waste from empty bottles and jugs, the amount of time it takes to handle each bottle, and the amount of spilled fluid is greatly reduced when using bulk fluid storage tanks. Bulk fluid storage tanks typically hold amounts of liquid greater than 100 gallons for the use of all mechanics within the building.

A tank level monitor is an integral component of the storage tank and will signal the low-level condition at which point the lubrication distributor would refill the storage tanks. Storage tanks are also equipped with a sensor that signals an alarm to sound in the event of a leak.

Bulk fluid storage tanks are typically double-walled to conform to the code requirement for spill containment. Another method of containing leaks is to provide a recessed concrete pit in the bulk fluid storage room directly underneath the bulk fluid tanks. Whichever method is chosen, 110 percent of the storage capacity of the tank needs to be contained in the event of a leak, as required by code.

Delivery Pumps:

Fluids need to be pumped from the bulk fluid storage tanks to the point of application in the maintenance bays area.

Piston Pumps:

Pneumatically-powered piston pumps are powerful enough to transfer the fluid from the storage tank to the point of application, hundreds of feet away. Piston pumps can be mounted directly on top of the tank to dampen vibrations. Piston pumps are loud pieces of equipment (73 - 80 dB(A)). Noise dampening is one reason to enclose the lubrication storage area with heavy walls.

Diaphragm Pumps:

Diaphragm pumps can also be used to pump fluid from the bulk fluid storage room to the maintenance bays. These pumps do not offer any mechanical advantage – the pressure of the compressed air supply is equal to the pressure of the fluid at the discharge end of the pump at a low flow condition.

Diaphragm pumps are typically used for diesel exhaust fluid and engine coolant but are also capable of transferring engine oil, hydraulic oil, automatic transmission fluid, windshield washer fluid, diesel fuel, and gasoline.

Another special case involves the pumping of engine coolant when the coolant is provided as a concentrate. A 30-gallon drum of water with a float valve is typically specified when mixing the concentrated engine coolant with the water. The diaphragm pump handles the mixing duty to supply a mixture of coolant to water at the desired ratio.

Piping:

The size of each pipe varies according to the distance that the fluid travels from the storage tank to the point of application. To determine the size of the pipe required to ensure that fluid will transfer from the lubrication storage room to the point of application, the lubrication system designer will need to know how many dispensers stemming from the same pipeline header are requested to be in use at any given time. Generally, the pipe size increases as the demand of fluid flow increases. Wall thicknesses also need to be considered when selecting the pipe to provide the rigidity necessary to keep the pipe from bursting. The fluid pressure within the pipe is typically 1,000 PSI and even more for chassis grease.

The cross section of a header can be designed to decrease over the length of the run from the storage tank to the maintenance bays. This will help to decrease the cost of materials and will also ensure an acceptable fluid pressure at the point of application. The lubrication system designer calculates the size of pipe based on fluid mechanics equations.

The pumps are also sized in this way to ensure that the pipe length and the pumps are paired to dispense fluid at the furthest point of application.

The type of the pipe selection varies according to the type of fluid being transferred. Bulk fluid liquids may flow through carbon steel. Compressed air will be routed through copper to prevent corrosion. Compressed air does not require pipe of a high tensile strength because it operates at a comparatively low pressure than other fluids.

Lubrication/Commodity Hose Reels and Nozzles:

Lubrication hose reels are stationary units in the bays and piped from bulk storage tanks. These reels are in areas where maintenance and re-filling of fluids occurs, typically overhead on columns or mounted to nearby walls. Technicians can quickly dispense and measure fluids being dispensed into vehicles.

Hoses comprise the final length of fluid transfer material before exiting through the point of application (the nozzle). Hose reels offer the convenience of retracting the hose with no significant effort by the user to move the hoses out of the work space. This eliminates tripping hazards and it decreases the amount of time required to move the hose from the work area.

Multiple hose reels can be grouped in parallel and mounted onto the same bracket. In this case, the reels become a reel bank. Hose reels are typically installed overhead on columns, mounted to nearby walls, or are suspended from the ceiling structure.

Fluid Management System:

The volume of several types of fluids that the mechanics dispense can be tracked by use of the fluid management system.

The amount of each type of liquid can be monitored by the Fleet Manager to determine the appropriate time to order more bulk fluid from the distributor. The fluid management system tracks the amount of each dispensed liquid by each individual nozzle.

With the fluid management system, the user can enter the amount of fluid that they would like to dispense from the nozzle. The pump air controls will allow the transmission of compressed air to the pumps by the storage tank to allow pumping to commence.

Waste Recovery System:

When mechanics drain fluids such as oil and coolant from vehicles, a mobile receptacle is utilized to collect the used fluid. When the mechanics need to empty these containers, units can be rolled to nearby diaphragm pumps located in the maintenance area and used fluid can be pumped into respective storage tanks in the lubrication storage room. Tank level monitors are typically installed in the tanks to signal an alarm to sound when the tank gets above a certain level. When the tank is full, a used fluid evacuation company can be contacted to remove the used fluid from the storage tanks.

3.14.1 Equipment Manual

To provide further specificity and direction, HDR | MDG was asked in the Fall of 2018 to formulate specific equipment recommendations in consultation with SFMTA maintenance staff. Those recommendations are included in Appendix C and are also reflected in the equipment drawings within the Reference Design Concept document.

4.0 Introduction

The SFMTA envisions the rebuild Potrero Yard as an asset to the SFMTA's transit facility as well as a well-designed, contextual building that celebrates its core public transit use and sensitively designs interactions between untraditional shared uses. The architectural team designing the Potrero Yard Modernization Project shall have proven aesthetic design experience and talent to develop functionally economical as well as aesthetically attractive buildings. Design of the rebuilt Potrero Yard shall be informed by the Division 2 (*Design Guidelines)* of the Technical Requirements.

Coordinate exterior building design, locations for building functional areas and actual room dimensions by functional relationships, local zoning, codes, regulations, ADA requirements, and equipment.

4.1 Special Foundations

Special foundations to support combined building/crane columns, jib cranes, and laterally loaded piers/piles shall have appropriate geotechnical parameters based on soil testing and analysis. The effects of repetitive loads shall be taken into consideration for allowable bearing pressures, both vertically and horizontally. Rotations and deflections shall be limited to differential settlement and total settlement that meets the serviceability requirements of IBC for the given material.

4.1.1 Slab on Grade

The slabs on grade shall be placed atop engineered soils as required by PPC's Geotechnical Baseline Report. Provide continuous 15 mil vapor barrier meeting ASTM E 1745 Class A with a perm rating below 0.01 perms, immediately under slab over stone capillary break, under entire slab.

Design and locate joints to control and direct shrinkage cracking of concrete elements per ACI recommendations. Submit joint plan to the SFMTA for review and approval prior to placing exposed slabs and walls.

Concrete Floor Finishing: For all exposed concrete floors provide Euclid Surflex Light-Reflective Dry Shake Hardener sealed with Euclid Euco Diamond Hard or approved equal. The manufacturer's recommendations shall be followed including the use/non-use of fly ash and various troweling methods.

If Integrally Colored Ground and Polished Concrete is selected as a floor finish, special requirements include:

- In areas where polished concrete floors are to be installed, PPC shall fine grade the sub grade uniformly flat using a laser device as described in “CPAA Recommendations for the Design, Specification, and Placement of Concrete Floor Slabs” from the Concrete Polishing Association of America.
- A below slab vapor barrier shall be installed in accordance with CPAA recommendations and shall meet all properties described therein.
- The mix design, placing and finishing of concrete shall comply with ACI standards and CPAA recommendations.
- Curing compounds and densifiers other than those that are included in the selected manufacturer’s system shall not be used in areas of polished floor.
- Provide the following: Floor Flatness – specified overall value: 50, minimum local value: 35; Floor Levelness: - specified overall value: 30, minimum local value: 20. Flatness and levelness shall be tested within 8 hours after completion of the final troweling operation according to ASTM E1155 – 96 any out of tolerance work shall be remedied.
- Saw cut contraction joints shall be laid out by the Design Team and shall comply with CPAA recommendations.

4.1.2 Service/Inspection Lower Level Work Area

Service/Inspection LLWA’s shall be provided a continuous membrane waterproofing system for the pit walls and floors. Provide a gravity perimeter underdrain system.

4.1.3 Waterproofing and Damp Proofing

All site retaining walls, below grade walls, elevator and LLWA pits, and or below grade conditioned or occupied spaces, shall be provided a full waterproofing system. Provide drainage board, protection board, waterproofing and footing drains. Insulation, when required, is preferred to be exterior to the structure. Acceptable products include:

- Under slabs on grade: Heavy-duty membrane comprised of an HDPE film, pressure sensitive adhesive and weather resistant protective coating. Preprufe 300R or approved equal.
- On vertical surfaces: Self-adhesive rubber/ bitumen polyethylene waterproof membrane meeting ASTM E154 and ASTM D570. Bituthane 3000 or approved equal.
- For sandwich slabs, plaza decks above enclosed spaces and green roofs: Hot-applied rubberized asphalt meeting ASTM E-96, Procedure E and ASTM D-5329. Hydrotech MM6125 EV system or approved equal.
- Water based hydrophobic admixture shall be used in the concrete for construction of the below grade walls and floors forming the elevator, service pits, TPSS basement foundation. Product: Hycrete W1000 (W1002 for air entrained elements) or approved equal.
- Footing drains shall be provided at all waterproof assemblies and below grade foundations. Drains shall gravity drain to the extent feasible. Include below grade floors such as elevator and LLWAs. Rigid slotted PVC footing drains shall be set in a bed of crushed stone (minimum 12 inches of stone outboard and above pipe) wrapped with filter fabric. Drainage board material shall extend into the gravel bedding.
- Provide physical (dumbbell) water stops cast into the work at all concrete joints in assemblies to be waterproofed. Use of expansion/bentonite strip type water stops are permissible with prior SFMTA approval.
- Damp proofing shall be odorless and meet ASTM D-1187 Type II and ASTM D-1227 Type III. It is required at below grade concrete stem walls that do not have a face exposed to view. Karnak Corporation, Karnak 100 Non Fibrated Emulsion Coating, or approved equal.
- Where exposed to view, provide above grade concrete and masonry with a breathable, clear-drying, water-based silicone emulsion. Weather Seal Blok- Guard and Graffiti Control II by Prosoco or approved equal.

4.2 Shell - Super Structure

The structural framing shall be designed to include wind and seismic drift.

4.2.1 Floor Construction

Floor framing shall be designed for the dead and live loads to be used in the facility. In addition to the standard live loads presented in IBC, floors shall support equipment loading.

Concrete slabs to comply with ACI composite flatness and levelness ratings. The following slabs shall have the ratings listed below:

- Shop and storage areas: Flatness 35, Levelness 25.
- Thin-set tile and resilient floor: Flatness 35, Levelness 25.
- Carpeted areas: Flatness 25, Levelness 20.
- Areas where polished concrete flooring has been selected: Flatness 50, Levelness 30.

4.2.2 Roof Construction

Roof framing shall have adequate strength and stiffness to prevent ponding. Equipment

suspended from or set on the roof shall be included in the design of the roof members. Roofs shall have a minimum slope of ½-inch per linear foot or greater as required by the roofing system selected.

Roof access shall be provided for all roofs.

Provide OSHA compliant roof fall protection/ restraint system for access to all roof areas. The design shall include the ability for maintenance to provide for safe and accessible cleaning of windows per ANSI/IWCA I-14 Window Cleaning Safety Standards.

4.3 Exterior Enclosure

The Potrero Yard, including the roofs, may be visible from both the street level and adjacent development around and above the site. The buildings, facades and roofs shall be visually pleasing. The SFMTA shall accept the project aesthetics prior to submittal for design review to the SF Planning Department. Exterior finishes selected must meet SF Planning requirements.

Sustainability requirements may also drive material choices. Energy Code requirements establish the minimum building envelope performance. In the event of a conflict, the most stringent code will apply. The building enclosure shall be designed to preclude birds or other wildlife from nesting or otherwise taking up residence.

4.3.1 Exterior Walls

Exterior materials shall be considered on the basis of durability and appearance with the understanding that a minimum 50 year low maintenance life expectancy and 100 year minimum building lifespan is mandated. The SFMTA prefers the use of materials that require little refinishing or maintenance such as stainless steel, aluminum, glass, materials with anodized or factory finishes, materials with integral color, brick, terracotta, architectural pre-cast, or architectural exposed concrete.

Synthetic stucco, simulated materials such as river rock or other faux cladding, architectural foam detailing and aluminum, plastic, wood or vinyl siding will not be acceptable. Compliance with the City and County of San Francisco Development Standards is mandatory.

At a minimum, the bottom four feet above grade at vehicle entrances and exits of the building shall consist of a hard material such as masonry or concrete.

Coordinate all elements of the wall assembly, including flashing, trim and transitions between materials to provide a weatherproof installation requiring little maintenance, detailed to limit accumulation of dirt or staining.

4.3.2 Water and Air Barrier

Provide City and County of San Francisco Energy Code compliant, fluid-applied, vapor-permeable, water and air barrier membrane system.

Performance Requirements:

- Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits. Air leakage testing of the building envelope air barrier installation, as described in the Energy Code, is required prior to covering the air barrier.
- Membrane Air Permeance: (comply with current City and County of San Francisco Energy Code) Not to exceed 0.004 CFM by sf of surface area 4 at 1.57 pounds per sf pressure difference; ASTM E2178 5.
- Membrane Vapor Permeance: Not less than 10 perms; ASTM E96/E96M; Air Barrier systems other than that listed above will be considered on a case by case basis and require the SFMTA approval.
- Acceptable Product: Air Block 17 MR by Henry Company with associated auxiliary materials to provide a complete system including but not limited to transition membranes, sheathing joint membranes, adhesives and primers, sealants and self-adhesive thru-wall flashing, or approved equal. Obtain complete air barrier system from a single source.

4.3.3 Weather Barriers

Non-occupied / non-conditioned locations only: Provide a complete weather resistive barrier for all enclosed spaces and all wall assemblies requiring weather protection.

Provide flexible flashing as required to form a weather tight envelope. All openings to be fully wrapped with waterproof flexible flashing with joints shingle lapped. Seal all penetrations through the weather resistive barrier to create one continuous weather barrier enclosure.

Provide Weather Resistive Barrier as made by Vaproshield, or approved equal.

Provide Waterproof Flexible Flashing Blueskin by Henry, Vycor by Grace or approved equal.

4.3.4 Exterior Masonry

The following technical requirements shall be met by the Design Team if masonry is selected as a part of the building enclosure:

Unit Masonry, General:

- Unit masonry shall be utilized in a cavity wall that functions as a rain screen. Painted masonry will not be allowed.
- CMU is not permitted for the exterior.
- Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6.
- Where unit masonry is selected as a building material, design the building utilizing masonry module, both in plan and elevation, ensure coursing is designed for either full or half block for overall dimensions, control joints, and at all openings.
- Substrate supports for veneer masonry to have a maximum horizontal deflection of 1/720 of the wall height.
- Where exposed to view, provide above grade concrete and masonry with a breathable, clear-drying, water-based silicone emulsion. Weather Seal Blok- Guard and Graffiti Control II by Prosoco or approved equal.

Performance Requirements:

- Provide structural or non-structural unit masonry that develops indicated net-area compressive strengths at 28 days.
- Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ ACI 530.1/ASCE 6.

Concrete Masonry Units:

- Integral Water Repellent: Provide units made with integral water repellent such as Dri-Block.
- CMUs- Standard, Decorative and Pre-faced: ASTM C 90
  - ✓ Ground face may be used for unpainted exposed locations on the interior the maintenance facility.
  - ✓ Textured block faces (split face, ribbed etc.) are not acceptable.
  - ✓ Painted CMU on the exterior of the building is not acceptable.
  - ✓ Concrete Building Brick: ASTM C 55.

Brick - Clay Face Brick:

- Facing brick complying with ASTM C 216 SW or hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area). No oversized brick allowed. Norman modules preferred.
- Embedded Flashing Materials- Provide continuous flashings at base of wall, heads of openings and under wall caps.
  - ✓ Metal Flashing: Provide metal flashing complying with SMACNA's Architectural Sheet Metal Manual. Use one of the following:
    - ○ Stainless Steel: All through wall flashings shall be 26 gauge, three way keyed stainless steel ASTM A 240/A 240M or ASTM A 666, Type 304. Where flashing is exposed at the touch zone (less than 9-feet 0-inches) the gauge shall be 24 gauge stainless.
    - ○ Flexible Flashing: Use only with the SFMTA approval.

Miscellaneous Masonry Design Requirements:

- Ties and Anchors:
  - ✓ General: Ties and anchors shall extend at least 1-1/2-inches into veneer but with at least a 5/8-inch cover on outside face.
  - ✓ Utilize adjustable type 316 stainless steel ties installed in horizontal joints at not less than one metal tie for 4.5 sf of wall area spaced not to exceed 36-inches o.c. horizontally and 16-inches o.c. vertically. Stagger ties in alternate courses.
  - ✓ Provide additional ties within 12-inches of openings and space not more than 36-inches apart around perimeter of openings.
  - ✓ At intersecting and abutting walls, provide ties at no more than 24-inches o.c. vertically. Acceptable product: Hohmann and Barnard DW-10 or approved equal.
- Weep/Cavity Vent and Drainage Products:
  - ✓ Provide both, weeps at the base of the cavity and a minimum equal number of vents at the top of the cavity. Maintain clear airflow space of 1-1/2-inches minimum to face of insulation. Open head joints with mesh required in lieu of rope, tubes or formed inserts. Vertical compartmentalization is required such that no horizontal brick cavity space is longer than 25-feet. All building corners to be compartmentalized within 4-feet of the corner. Provide flashing (if at a control joint) or additional building insulation to back brick face such as to prevent horizontal air flow within the cavity.

- ✓ Provide mortar mesh at all through wall flashings and lintel locations.
- Control Joints:
  - ✓ Control Joints in brick masonry walls shall be placed at openings, near corners, at wall intersections, changes in wall height and as described in the Brick Industry Association document Technical Notes 18A “Accommodating Expansion of Brickwork”.
  - ✓ Control joints in CMU walls shall be placed at/near openings, near corners, at wall intersections, changes in wall height or thickness and as described in the National Concrete Masonry Association documents TEK 10-2C or TEK 10-3.
- Minimum 1-1/2-inch airflow space between masonry and insulation
- Steel Lintels shall be hot dipped galvanized, primed and painted per Prescriptive Specification 90 96 00 High Performance Coatings.
- Precast Concrete Coping, Trim and Cladding.
  - ✓ Precast coping units to be utilized for wall caps on masonry walls and veneer. Coping units to include slope for surface drainage and one inch minimum overhang with cast in drip.
  - ✓ Provide mechanical anchorage utilizing stainless steel materials. Provide sealant joints between all cap units and between adjacent materials.
- Submittals - Material sample(s), mock-ups, shop drawings, anchorage and reinforcing materials.

4.3.5 Metal Panels

The following technical requirements shall be met by the Design Team if a metal panel system is selected as a part of the building enclosure:

Warranties:

- Special Warranty: manufacturer agreement to repair or replace components of metal panel systems that fail in materials or workmanship within the specified warranty period. Failures include but are not limited to - structural failures (rupturing, cracking, puncturing); deterioration of metals and other materials beyond normal weathering. Warranty Period: Two years from date of Substantial Completion.
- Special Warranty on Panel Finishes: manufacturer agreement to repair or replace metal panels that show evidence of deterioration of factory applied finishes within specified warranty period – including but not limited to color fading more than 5 Hunter unites when tested according to ASTM D 2244; chalking in excess of a No. 8 rating when tested according to ASTM D 4214; cracking, checking, peeling, or failure of paint to adhere to bare metal. Warranty Period: 20 years from date of Substantial Completion.

Minimum Performance Requirements Common to all panel types:

- Air Infiltration: Air leakage of not more than 0.06 CFM/sf when tested according to ASTM E 283 at a test-pressure difference of 6.24 lb/sf.
- Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the test-pressure difference of 6.24 lb/sf.
- Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss for a temperature change range of 120 degrees F, ambient; 180 degrees F, material surfaces.
- Provide a concealed fastener wall system with minimum 22 gauge panels.

Minimum Finish requirements:

- Two coat fluoropolymer (AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers’ written instructions), - Kynar 500/ Hylar 5000.
- Metal Wall Panels- Plate (Rain screen type):
  - ✓ Additional Minimum Performance Requirements:
    - Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency and indicate design designations from UL’s “Fire Resistance Directory”.
  - ✓ Acceptable Products: AEP Span: Prestige Series; Centria: FormaBond or FormaBond II; or approved equal.
- Metal Wall Panels – Insulated:
  - ✓ Additional Minimum Performance Requirements:
    - Structural Performance: Provide metal panel systems capable of withstanding

the effects of the following loads, based on testing according to ASTM E 72:

  – Wind and seismic loads per IBC; deflection limits for wind loads no greater than 1/240 of the span.

✓ Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

✓ Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119

✓ Intermediate-Scale Multistory Fire Test: Tested mock-up, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.

✓ Radiant Heat Exposure: No ignition when tested according to NFPA 268.

✓ Potential Heat: Acceptable level when tested according to NFPA 259.

✓ Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

- Acceptable Products: MBCI eco-FICIENT panels; Centria Versawall or approved equal.

4.3.6 Precast Architectural Concrete

The following technical requirements shall be met by the Design Team if precast architectural concrete is selected as a part of the building enclosure:

Performance Requirements:

- A qualified professional engineer shall design architectural precast concrete units.
- Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Pre-stressed Concrete," applicable to types of architectural precast concrete units included in design.
- (As applicable) Calculated Fire-Test-Response Characteristics: Provide architectural precast concrete units with fire-resistance rating indicated as calculated according to ACI 216.1 (for precast concrete) or PCI MNL 124, "Design for Fire Resistance of Precast Pre-stressed Concrete," (for precast pre-stressed concrete) and acceptable to authorities having jurisdiction.
- Precast concrete units and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements as follows:
  - ✓ Upward and downward movement of ½-inch.
  - ✓ Anchorage: Provide mechanical anchorage utilizing stainless steel materials. Provide sealant joints between all cap units and between adjacent materials.
  - ✓ Fabrication Tolerances: Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.
  - ✓ Finishes: Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp.
  - ✓ Submittals- Product data and samples, mock up and shop drawings.

4.3.7 Sheathing

The following technical requirements shall be met by the Design Team when sheathing is utilized as a part of the building enclosure:

Performance Requirements:

- Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- Do not use Plywood Sheathing, Paper-Surfaced Gypsum Sheathing, Cellulose Fiber-Reinforced Gypsum Sheathing, Cementitious Backer Units, Fiberboard Sheathing Extruded-Polystyrene Foam Sheathing or Foil-Faced Polyisocyanurate Foam Sheathing for roof or wall applications unless approved by the SFMTA.
- Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
- Type and Thickness: Type X, 5/8-inch Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M
- Acceptable Products: DensGlass by Georgia-Pacific or approved equal (walls); DensDeck by Georgia-Pacific or approved equal (roof)

SECTION 4 - PERFORMANCE REQUIREMENTS

4.3.8 Cold Formed Framing

The following technical requirements shall be met by the Design Team when cold formed framing is utilized as a part of the building enclosure:

Performance Requirements:

- A qualified professional engineer shall design all cold formed steel framing.
- Cold Formed Steel Framing Design Standards:
  - ✓ Floor and Roof Systems: AISI S210.
  - ✓ Wall Studs: AISI S211.
  - ✓ Headers: AISI S212.
  - ✓ Lateral Design: AISI S213.
- AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
  - ✓ Upward and downward movement of 1/2-inch.
  - ✓ Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- Fire-Resistance Ratings (where applies): Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- All cold formed framing to be galvanized, minimum G60.

4.3.9 Insulation

Provide insulation in walls, roof and under slab to meet or exceed the Energy Code requirements. Provide all insulation in thicknesses, widths, and lengths sized to fit applications and to meet code requirements. Exposed, faced, bagged or scrimmed insulation is not acceptable. All insulation materials integrated into the work shall NOT contain: added urea formaldehyde, nor halogenated flame retardants. All products and their manufacturing processes shall be CFC and HCFC free. Rockwool insulation materials in the form and density appropriate for the application and performance required unless noted otherwise.

- Accessories: Provide fasteners and adhesives required to attach insulation to substrates per manufacturer's recommendations.
- Insulation for Miscellaneous Voids: Spray Polyurethane Foam Insulation (Limited use only for penetration sealing): ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- Below Grade Insulation: EPS – Expanded Polystyrene. Recycled preferred.(Benchmark Foam, Inc. for reference).

4.3.10 Sheet Metal Flashing

Acceptable materials: Stainless Steel ASTM A 240/A 240M Type 316 Finish 2B (bright, cold rolled).

Sheet metal (steel or aluminum) finished with same system as adjacent metal panels or storefront/curtainwall system or as approved by the SFMTA. Finish Warranty Period: 20 years from date of Substantial Completion.

4.3.11 Exterior Windows

Daylight glazing shall be incorporated to allow for a reduction in artificial lighting and shall meet or exceed the percentage required by the Sustainability Checklist. Daylighting strategies shall be incorporated in the design of all spaces including shop areas.

All exterior glazing shall meet fenestration performance requirements of the most stringent energy code. Glazing shall be located and designed so as to be accessible for cleaning and window washing attachment systems shall be provided as needed. Window frames shall be prefinished aluminum. Frames are required to be thermally broken.

Provide solid surface window sills, 3/4-inch thickness minimum, at all locations.

4.3.12 Glazing

Glazing shall perform successfully within an assembly that complies with the Energy Code, meeting or exceeding in performance the maximum U Value and SHGC for the assembly selected by the Design Team. All glazing shall be captured in a frame assembly. Butt-Glazed lites are not acceptable.

Acceptable manufacturers: Pilkington North America Inc, PPG Industries, Inc, AGC Glass Company North America, Guardian Industries, Saint-Gobain Corporation or approved equal.

The following technical requirements shall be met by the Design Team where glazing is utilized as a part of the building enclosure:

Warranties:

- Manufacturer's Standard and Special warranties for each product used.
  - ✓ Warranty Period: 10 years from Substantial Completion.

- ✓ For each glass type and all glazing accessories – Obtain from single source from single manufacturer.

Performance:

- General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- Design: Engauge a qualified professional engineer, to design glazing.
- Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300 and Design Team Design Team per the applicable codes.
- Provide Float Glass per ASTM C1036.
- Safety Glass: ASTM C1172, and ANSI Z97.1, laminated and tempered as indicated or required by code.
- Heat Strengthened Laminated Float Glass (at overhead conditions including clerestories): Two sheets of heat strengthened 1/4-inch thick (minimum) clear float glass fully-bonded, high-impact, UV-resistant, clear polyvinyl butyl interlayer 0.030-inch minimum thickness;
- Laminated Glass (at skylights): Per DCM "Canopy glazing" Clear float glass with 65 percent VLT white interlayer to reduce glare and minimize visibility of dirt, unless approved otherwise by the SFMTA. Plastic, polycarbonate, fiberglass or similar skylights are not acceptable.
- All tempered glass to be heat soak tested.
- Insulated glazing units: Provide sealed insulating glass: per ASTM E 2190, double pane; total unit thickness of 1-inch minimum. Inner and outer pane types subject to requirements at all glazing in conditioned spaces; Basis of Design: Solarban 70 XL manufactured by PPG or approved equal.
  - ✓ Interpane Space: Dry hermetic air, kept dry with a dehydrating agent; Edge
  - ✓ Seal Construction: Dual seal, silicone foam warm-edge spacer system with high-performance acrylic adhesive structural seal, backed with moisture vapor seal.
  - ✓ Edge seal color to be black.
  - ✓ Super Spacer by Edgetech IG.
- Vision Glass Units Performance: Subject to conformance to requirements, provide sealed insulating glass units with minimum performance values based on units comprising an outer lite of 1/4-inch float glass, 1/2-inch air space and, inner lite of 1/4-inch clear float glass with Low E coating on third surface.
  - ✓ Visible Light Transmittance: 69 percent; Winter Nighttime U-Factor: 0.29.
  - ✓ Shading Coefficient: 0.44; Low Emissivity (Low E).
  - ✓ Glass Low-e Coating: Soft, sputtered applied to third surface; hard, pyrolytic coating on second surface for over-size glass units.
- Provide glazing sealants that are compatible with one another and with other materials they will contact, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- Structural Silicone Sealant for Glass Joints: Not allowed.
- Provide glazing accessories, including:
  - ✓ Lock Strip Gaskets: ASTM C542, ozone-resistant precision extruded neoprene or EPDM compound. Use gaskets with separate locking strips that are 10-points higher Shore A durometer hardness value than gasket body.
  - ✓ Fabricate gaskets in accordance with recommendations of ASTM C716.
  - ✓ Setting Blocks: Neoprene, EPDM or silicone, 80 to 90 Shore A durometer hardness tested to ASTM D2240. Maximum compression set to ASTM D395 and ASTM C864.
  - ✓ Spacers: Neoprene EPDM or silicone, 40 to 60 Shore A durometer hardness tested to ASTM D2240; quantity and location in accordance with IGMAC standards and as recommended by the frame and glass manufacturer.
  - ✓ Glazing Tape: AAMA 806.3, preformed butyl compound, UV resistant, self-adhering, coiled on release paper, color as selected by Owner's Representative; Pre-Shimmed Glazing Tape: AAMA 806.3, pre-formed butyl tape, UV resistant, self-adhering, integral continuous serrated synthetic rubber shim and release paper, color: black.

- ✓ Glazing Wedges and Splines: Precision extruded neoprene or EPDM compound, UV resistant, 55 to 65 Shore A durometer hardness.
- Labeling:
  - ✓ Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
  - ✓ Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- Submit: 12-inch by 12-inch samples for each glass type with fabricator product information.

4.3.13 Storefront

The following technical requirements shall be met by the Design Team where storefront is utilized as a part of the building enclosure:

- For glazed Aluminum Storefront and Entrances provide self-supporting, factory prefinished, thermally broken, glazed aluminum tube framing system. Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.
- Basis of design: Model 433 manufactured by EFCO for aluminum storefront, or approved equal. Entrance Doors: EFCO D518 HD style or approved equal.

Performance:

- General Performance: Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
- Test according to ASTM E 330 as follows:
  - ✓ When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  - ✓ When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  - ✓ Test Durations: As required by design wind velocity, but not less than 10 seconds.
- Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
  - ✓ Fixed Framing and Glass Area: Maximum air leakage of 0.06 CFM/sf at a static-air-pressure differential of 6.24 lb/sf.
  - ✓ Entrance doors:
    - ○ Pair of Doors: Maximum air leakage of 1.0 CFM/sf at a static-air-pressure differential of 1.57 lb/sf.
    - ○ Single Doors: Maximum air leakage of 0.5 CFM/sf at a static-air-pressure differential of 1.57 lb/sf.
- Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
  - ✓ No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lb/sf.
  - ✓ Maximum Water Leakage: According to AAMA 501.1 no uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

Minimum acceptable aluminum finishes:

- Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4.3.14 Operable Windows

The following technical requirements shall be met by the Design Team where operable windows are utilized as a part of the building enclosure:

- Provide operable (casement or awning as approved by the SFMTA) prefabricated aluminum windows with thermally broken frames and insulated glazing to meet Energy Code and sustainability requirements.

All windows shall have stainless steel screens and locking hardware. Finish to be manufacturer's standard Class I, coating that meets AAMA 2604. Clear anodic or two coat fluoropolymer (Kynar 500/ Hylar 5000) acceptable.

- Window performance: Windows shall conform to all AAMA/WDMA/CSA 101/I.S.2/A440-08 requirements for AW grade windows and shall meet all performance criteria of the basis of design product.
- Basis of Design: Series 2700 by EFCO or approved equal.

4.3.15 Glazed Aluminum Curtain Walls

The following technical requirements shall be met by the Design Team when a curtain wall system is utilized as a part of the building enclosure:

Warranties:

- Special Assembly Warranty: Manufacturer's standard 10 years from date of Substantial Completion.
- Special Finish Warranty: Manufacturer's standard 20 years from date of Substantial Completion.

Performance Requirements:

- Analysis and design data signed and sealed by the qualified registered professional engineer responsible for their preparation.
- General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those selected for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - ✓ Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - ✓ Failure also includes the following:
    - Thermal stresses transferring to building structure.
    - Glass breakage.
    - Noise or vibration created by wind and thermal and structural movements.
    - Loosening or weakening of fasteners, attachments, and other components.
    - Failure of operating units.

Structural:

- Test according to ASTM E 330 as follows:
  - ✓ When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  - ✓ When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
- Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
  - ✓ Fixed Framing and Glass Area: Maximum air leakage of 6.24 lb/sf.
- Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
  - ✓ No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lb/sf.
- Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
  - ✓ No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lb/sf.
  - ✓ Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to applicable codes by Design Team
  - ✓ Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
  - ✓ Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.
  - ✓ Energy Performance: Certify and label energy performance according to NFRC. Fixed glazing and framing areas shall have U-factor of not more than that

required by the most stringent Energy Code as determined according to NFRC.

- ✓ Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than that required by the most stringent Energy Code as determined according to NFRC 200.
- ✓ Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.

- Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

Minimum acceptable finishes:

- Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker
- High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.
  - ✓ Acceptable manufacturers: Kawneer, EFCO or approved equal.

4.3.16 Exterior Doors

Exterior doors must comply with the most stringent energy code requirements for thermal performance and air infiltration. Any stainless steel utilized in doors or door hardware shall be Type 316. Type 304 stainless steel will be unacceptable. Storefront doors shall be utilized at vestibule entrances to administrative and office areas.

All exterior doors, including roof access doors, shall be coordinated with the security/intrusion detection/access control system design for the facility.

4.3.17 Exterior Hollow Metal Doors and Frames

The following technical requirements shall be met by the Design Team where hollow meal doors are utilized as a part of the building enclosure:

- General: Maximum-Duty Doors and Frames: SDI A250.8, Level 4.
- Physical Performance: Level A according to SDI A250.4.
- Frames: Metallic-coated steel sheet, minimum 14 gauge. All frames to be fully welded, and of commercial quality cold rolled sheet metal in conformance with ASTM A1008. Exterior frames (frames from conditioned to unconditioned spaces) shall be thermally broken, constructed of hot-dip galvanized steel in conformance with ASTM A-653, G90 coating designation.
- Lites: Exterior hollow metal doors to have insulated glass narrow lites or half lites as directed by the SFMTA.
- Anchors: Masonry Type: Locate anchors not more than 16-inches from top and bottom of frame. Space anchors not more than 32-inches o.c., to match coursing, and as follows: Three anchors per jamb from 60- to 90-inches high.
- Stud Wall Type: Locate anchors not more than 18-inches from top and bottom of frame. Space anchors not more than 32-inches o.c. and as follows: Three anchors per jamb up to 60-inches high.
- Door Hardware: Locking and keying systems shall be fully compatible with the SFMTA standard system.
  - ✓ All exterior doors shall be coordinated with the security/intrusion detection/access control system design for the facility and shall comply with security standards.
  - ✓ Door and Frame Finishes: Doors and frames to be factory primed with galvalume primer compatible with top coats by the same manufacturer and then field painted. Exterior service doors and frames shall be finished with a high performance industrial coating.

4.3.18 Sectional Doors

The following technical requirements shall be met by the Design Team if sectional doors are utilized as a part of the building enclosure:

Special Warranty:

- Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
  - ✓ Warranty Period: Minimum Two (2) years from date of Substantial Completion.

Performance Requirements:

- Structural Performance:
  - ✓ Design Wind Load: as determined by Design Team per applicable codes.
  - ✓ Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
    - ○ Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
    - ○ Deflection of horizontal track assembly shall not exceed 1/240 of the door height.
    - ○ Seismic Performance: Sectional doors shall withstand the effects of earthquake

motions determined according to ASCE/SEI 7 and as determined by Design Team per applicable codes.

- Doors:
  - ✓ Sectional door formed with hinged sections and fabricated according to DASMA 102 consisting of minimum 16 gauge galvanized steel exterior face and minimum 26 gauge steel interior face with polystyrene insulation with fire retardant additive to meet requirements of UL R-1894A. R-Value for door shall meet or exceed Energy Code requirements.
  - ✓ Operation Cycles: door components and operators capable of operating for not less than 25,000 cycles.
  - ✓ Air infiltration: Maximum 0.08 CFM/sf.
  - ✓ Track Configuration: Vertical Lift.
  - ✓ Provide replaceable weather seals at jambs, head and sill.
  - ✓ Provide Keyed lock (compatible with the SFMTA system) with interlock switch for automatic operator.
  - ✓ Provide kick plate
- Operator:
  - ✓ Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL 325/2010 requirements for continuous monitoring of safety devices.
  - ✓ Usage Classification: Heavy-duty, 25 or more cycles per hour and more than 90 cycles per day.
  - ✓ Motor Exposure: Exterior, dust, wet, or humid.
  - ✓ Emergency Manual Operation: Chain type.
  - ✓ Acceptable Safety/Obstruction Detection Devices (provide a minimum of one of the following): photoelectric sensor, electric sensing edge, pneumatic sensing edge.
  - ✓ Control Station: Interior and exterior, exterior location to be security access controlled.
- Finish: Door to be finished per system HPC-3.
- Acceptable Products: Model 418 by Overhead Door or approved equal

4.3.19 Exterior Door Hardware

All door hardware sets are to be reviewed and approved by the SFMTA. Default hardware material to be stainless steel. Alternate materials may be utilized with the SFMTA approval.

At a minimum, provide the following standard sets of hardware for exterior doors (single doors listed – adjust for pairs of doors accordingly):

Storefront doors: Offset Pivots (three minimum), surface mounted closer, push/pull set, exit device (as required by code), weatherstripping/sweep, threshold, entry/exit device (as applies) – the SFMTA standard card reader access control system and/or intrusion detection alarm. For doors without access control provide deadlock and cylinder.

Hollow Metal Personnel door: Hinges (3 minimum), mortise lockset, surface mounted closer, stop, exit device (as required by code), weatherstripping/sweep, rain drip, kick plate, threshold, entry/exit device (as applies), the SFMTA standard card reader access control system (as applies), door contact.

Hollow Metal Service Door (exit only): Hinges (three minimum), mortise lockset, surface mounted closer, stop, exit device (as required by code), weatherstripping/sweep, rain drip, kick plate, threshold, entry/exit device (as applies), the SFMTA standard intrusion detection (as applies),

Provide internal flush bolt for pairs of non-egress doors with an inactive leaf. Provide an automatic flush bolt and coordinator for doors with two active leafs.

4.3.20 Exterior Stairs

Exterior stairs shall be constructed of cast in place concrete with non-slip surface finish treads (Light broom finish with grooves cast directly in the treads).

4.3.21 Exterior Handrails and Guardrails

All handrails and top guardrails shall be stainless steel 316 with random orbital finish. Intermediate infill of railings may be stainless steel (preferred) or painted steel with highest durability paint system. Where welded wire mesh is used, use stainless steel or steel mesh with each joint welded prior to painting otherwise the joints will not be coated with paint and they will rust.

4.3.22 Roof Coverings

Roofing systems selected shall meet the most stringent Energy Code requirements for thermal and air barrier performance and shall meet LEED Gold certification requirements. Roofing must also meet all applicable City and County of San Francisco Building Code criteria as well as general recommendations and guidelines of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manuals. Selection of roofing systems shall be driven

by a requirement for long term durability and appearance as well as sustainable criteria to reduce the Heat Island Effect. Roof deck coverings shall be UL listed Class A or Class B in accordance with the IFC and NFPA. Roofing design shall facilitate adequate shedding and diversion of water from the storm water system to use in landscape irrigation and water re-use systems. Flashing shall be either stainless steel, or steel with a baked on finish or factory finished to match metal panel systems.

If selected, metal panel steep slope roofing shall be of the architectural standing seam type and shall be replaceable without disturbing the building occupants. Metal roofing must comply with the NRCA Waterproofing Manual and the Metal Building Manufacturers Association (MBMA) Metal Roofing Systems Design Manual and provide adequate water-shedding with a focus on diversion of water from the storm water system to use in landscape irrigation or other water reuse systems.

If selected, low slope roofing shall be a single ply system such as TPO or PVC. EPDM, built up or modified bitumen roofing will not be acceptable. Type 316 stainless steel conductor boxes, gutters and downspouts with stainless steel flashing shall be required.

Asphalt or wood shingles and clay tile will not be acceptable roof materials.

The roofing system selected must comply with the insurer's FM ratings for wind, fire and storm warranty. Coordinate roofing system selected with mounting for future photovoltaic requirements.

4.3.23 Thermoplastic Polyolefin (TPO) Roofing

Provide a fully adhered roofing system with Flexible Walkways to all roof mounted elements requiring maintenance. Roofing system shall include substrate board, ASTM C 1177/C, glass mat and slip sheet.

- Basis of design product: Firestone UltraPly™ TPO SA with Secure Bond™ Technology or approved equal.
- Warranty Period: Twenty five (25) years from substantial completion.
- Provide metal termination bars, metal battens, pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories as required.

4.3.24 Polyvinyl-Chloride (PVC) Roofing

Provide a fully adhered roofing system with Flexible Walkways to all roof mounted elements requiring maintenance. Roofing system shall include substrate board, ASTM C 1177/C, glass mat and slip sheet. PVC Sheet: ASTM D 4434/D 4434M, Type II, Grade I, glass-fiber reinforced, felt backed, 60 mils thickness.

- Basis of design product: Sikaplan Adhered Energy Smart Roof membrane or approved equal.
- Warranty Period: Fifteen (15) years from substantial completion.

4.3.25 Standing Seam Metal Roof Panels

Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weather tight installation. Roof Panels shall be minimum 22 gauge.

- Minimum Finish requirements: Two coat fluoropolymer (AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions), - Kynar 500/ Hylar 5000.
- Basis of Design Product: AEP Span Klip Rib or Design Span HP.

4.3.26 Canopies and Protective Covers

Provide canopies or protective covers at all entrances to the building. All overhangs and coverings shall be designed to prevent bird nesting and shall have a minimum 1.5 percent slope. Structural performance of canopies shall be determined by a licensed professional engineer and shall withstand the effects of gravity loads and the additional live, roof, snow, seismic and wind loads and stresses as determined by the Design Team per applicable codes.

4.3.27 Skylights

Skylights must comply with Energy Code performance requirements and fenestration limitations as well as applicable building code provisions. Openings associated with mechanical equipment or roof access shall comply with all energy that apply to roof coverings. All roof openings shall be coordinated with the security/intrusion detection/ access control system design for the facility.

Laminated insulated glass skylights with white translucent interlayer are to be the basis of design. Thermally broken frames and insulated curbs, Preference is for use of clerestory daylighting strategies in lieu of horizontal glazing.

With the SFMTA approval and contingent upon the proposed design, use of factory pre-

engineered, 4-inch thick aluminum skylight with translucent panel, thermal break core, 60 percent light transmission. Kalwall Standard Skylites or approved equal. Kalwall Corrosion-resistant finish with a 10 year finish warranty.

4.3.28 Roof Accessories

Pitch pockets and similar configured penetrations are prohibited. Use of sheet metal enclosures similar to NCRA TS-15 detail required.

Horizontal clear space of 24-inches shall be provided between all penetrations, curbs, parapets, similar transitions to allow for sufficient space to properly install, maintain and replace roofing systems.

General Performance:

Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

- Roof Curbs and Equipment supports: Prefabricated aluminum, clear anodic finish, internally reinforced and factory insulated units with integrally formed roof deck-mounting flange at perimeter bottom. Provide curbs to minimum height of 12-inches above roofing surface.
- Roof Hatch: Prefabricated aluminum, clear anodic finish, thermally broken roof hatch with integrally formed roof deck-mounting flange at perimeter bottom. Note: a hatchway would be in addition to the required full stair roof access. Hardware: Spring operators, hold-open arm, stainless-steel spring latch with turn handles, stainless-steel butt- or pintle-type hinge system, and padlock hasps inside and outside. Intrusion detection shall be provided.
  - ✓ Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
  - ✓ Provide roof-hatch manufacturer's standard ladder-assist post and attachments.
  - ✓ Basis of Design product: Bilco thermally broken roof hatch.

4.3.29 Roof Access & Safety

Roof access shall be provided for all roof areas. Fixed metal ladders shall be provided where stair access is not available. Walk pads shall be installed on low slope roofs to allow access to all roof mounted equipment requiring servicing. Mounting equipment on steep slope roofs is discouraged due to the lack of easy access.

- Provide OSHA compliant fall protection systems for all roof areas. If any mechanical equipment is mounted on the roof it must meet the screening and maximum building height requirements allowed by the Bel-Red Ordinance.
- Provide roof to roof access (gangways) from roof areas that are not accessible by fire lane at ground level – coordinate any access requirements with the fire department.
- Changes in level on the roof exceeding 30-inches shall utilize a ladder or over the parapet ladder and platform complying with 29 CFR 1910.27. Ladders shall be constructed of stainless steel or aluminum. Rungs shall be provided an integral abraded finish. Galvanized or HPC painted ladders are not acceptable.

4.3.30 Exterior Joint Sealants

Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience. Joints shall be designed to meet the movement requirements for the installed conditions and shall present an aesthetic appearance that does not detract from the appearance of the building. The durability of the sealant shall also impact selection including aging characteristics and ultra-violet radiation, moisture, temperature, cyclic joint movement, movement during curing, and bio-degradation. Provide sealant backing or bond breaker as needed for specific applications.

Only sealants that have a current Validation Certificate from the SWRI (Sealant, Waterproofing & Restoration Institute) shall be utilized in the project. The Design Team shall confirm that all sealants selected meet the anticipated joint movement, are compatible with the materials they come in contact with and will adhere to the substrate(s) properly. Indicate joint locations, materials and spacing in construction document plans, elevations and details. Utilize sealants as follows:

- Latex (water based) sealants - not allowed on the exterior of the building.
- Acrylic (solvent-based) sealants – allowable for limited movement joints only as approved by the SFMTA.

- Butyl (solvent-based) – acceptable sealant for gutters, foundations and other non-exposed exterior joints.
- Silicone sealants – acceptable sealant for glass to metal framing systems and other porous and non-porous materials such as ceramic or stone panels.
- Polyurethane sealants – acceptable sealant for higher movement joints in concrete, masonry, metals, around window and door openings, expansion joints and other joints as approved by the sealant manufacturer.

Comply with joint sealant manufacturer's written instructions for products and applications indicated, unless more stringent requirements apply. Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

4.3.31 Expansion Control

Provide expansion control systems to accommodate building movement resulting from causes such as thermal change, seismic force or wind sway. Submit movement control diagrams addressing full structure. Submit calculations and rationale for joint locations, types and sizes. Expansion control elements shall match or be of a compatible color with the adjacent materials. Any exposed metal plates or covers shall be Type 316 stainless steel.

4.3.32 Exterior Signage

Exterior signage shall be designed and constructed per the SFMTA's corporate identify and brand standards. Refer to the Design Guidelines for notes on incorporating the SFMTA and Muni brands within the larger building architecture. The SFMTA shall sign off on all final signage designs. The SFMTA facility signage shall include:

- Customer Signage:
  - ✓ Main Facility Signage: provide at each vehicle entrance to the site.
- Exterior Door Signs: at all personnel and service doors.
- Operational Signage: Provide Operational signage as required per project. Coordinate with the SFMTA Operations.
- A custom designed facility sign shall be provided on the exterior façade of the facility. Sign shall be visible and legible, and be derived from the architectural design of the facility. Facility façade sign shall be illuminated.

Signage shall be designed to be architecturally compatible with the building and shall contribute to the overall character of the facility. Site signage within the facility shall follow the SFMTA standards and shall clearly identify circulation and safety elements as well as hazardous areas.

4.4 Interior Construction

Interior partitions in any maintenance and storage or shop areas shall be reinforced concrete masonry or concrete extending to underside of deck. Concrete or concrete masonry units at a minimum height of 8-feet 0-inches above finished floor with metal stud and impact and moisture resistant fiberglass faced gypsum wall board or AC plywood partitions above may be proposed for appropriate areas and will be considered on a case by case basis. Provide masonry control joints at a maximum of 25-feet 0-inches on center in continuous partitions, at maximum one half control joint spacing from both sides of corners, at changes in wall height or thickness, at building movement joints and at all openings.

Partitions in administrative, office, support type areas shall be constructed of metal studs with gypsum board. All interior partitions assemblies enclosing conference rooms, restrooms, offices and all rooms provided with access control shall extend to underside of deck.

Partitions enclosing custodial rooms, sprinkler valve rooms and restrooms shall have a minimum 6-inch high concrete curb. Wall finish shall cover curb in restrooms. Curb may be exposed in other rooms.

Refer to the Room Data Sheets for finishes and furnishings by room type. Joints and gaps at the base and top of the wall shall be sealed as well as joints at ceilings, corners or changes in material. Wall penetrations, including but not limited to ductwork, outlets or j-boxes, shall also be acoustically sealed in these rooms.

Submit for approval by the SFMTA product data, certificates and test reports verifying materials selected conform to performance standards listed in this document.

4.4.1 Interior Masonry

Concrete masonry units - Exterior Masonry, for concrete masonry unit descriptions and requirements. All interior CMU must be precision faced with a high performance coating. Outside corners and returns shall be bullnose block profile typical.

4.4.2 Gypsum Board

Performance Requirements:

- Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly according to ASTM E 119 by an independent testing agency.
- STC-Rated Assemblies: For STC-rated assemblies, provide materials and

construction identical to those tested in assembly according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

- Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lb/sf.
- Attach all gypsum board to steel stud partitions in accordance with the Northwest Wall and Ceiling Bureau (NWCB) Specification Standards Manual and ASTM C840.
- Paper faced gypsum board will not be allowed.
- Acceptable Interior Gypsum Board: Gypsum Board (office and support areas), Type X: ASTM C 1396/C 1396M, 5/8-inch.
  - ✓ Basis of Design: DensArmor Plus Fireguard High Performance Interior Panel.
- Abuse-Resistant Gypsum Board (corridor/high traffic/circulation areas, locker rooms (when not protected by lockers)): ASTM C 1629/C 1629M, Type X, 5/8-inch.
  - ✓ Surface Abrasion: Meets or exceeds Level 1 requirements.
  - ✓ Surface Indentation: Meets or exceeds Level 1 requirements.
  - ✓ Single-Drop Soft-Body Impact: Meets or exceeds Level 1 requirements.
  - ✓ Basis of Design: DensArmor Plus Fireguard Abuse Resistant Interior Panel.
- Impact-Resistant Gypsum Board (shop , tool box storage rooms, materials handling, shipping areas to 12-feet by 0-inches above finish floor.): ASTM C 1629/C 1629M, Type X, 5/8-inch.
  - ✓ Basis of Design: DensArmor Plus Fireguard Impact Resistant Panel.
- Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use; Type X, 5/8-inch.
- Acceptable Tile Backing Panels:
  - ✓ Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges, 5/8-inch thick. Tile backer board not acceptable.
- Auxiliary Materials:
  - ✓ Sound-Attenuation Blankets (required at all interior metal stud and gypsum board partitions and as required by mandated STC ratings in Room Data Sheets, Section Four of the Facility Program): ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
    - ○ Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
  - ✓ Acoustical Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- Gypsum Board Finish Levels: Finish panels to levels according to ASTM C 840. Finish all exposed gypsum board to a level 5 equivalent finish (use of a high solids primer or skim coat), ready to receive paint regardless of final finish. All exposed gypsum board is to be primed and painted UNO. Finish shall be establish by use of mock-up. Concealed areas may be a level 3 finish and remain unpainted unless vapor control is needed.

4.4.3 Non Structural Metal Framing

Performance Requirements:

- Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- Comply with requirements in ASTM C 840 that apply to framing installation for gypsum board assemblies.
- Framing System:
  - ✓ Framing Members, General: Comply with ASTM C 754.
  - ✓ Steel Sheet Components: Comply with ASTM C 645 requirements for metal.
  - ✓ Protective Coating: ASTM A 653/A 653M, G60 hot-dip galvanized.
  - ✓ Studs and Runners: ASTM C 645.
  - ✓ Minimum Base-Metal Thickness: 0.0329-inch (22 gauge).
  - ✓ Slip-Type Head Joints: Where required by design conditions, provide one of the following:

- Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
- Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- Firestop Tracks: (where required in fire rated assemblies) Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

✓ Provide blocking and Bracing behind all wall mounted items:
- Flat Strap and Backing Plate: Steel sheet, minimum base-metal thickness: 0.0747 (14 gauge).
- Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch wide flanges.

✓ Acceptable Furring:
- Hat-Shaped, Rigid Furring Channels: ASTM C 645, minimum .0179 (25 gauge).
- Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4-inch, wall attachment flange of 7/8-inch, minimum uncoated-metal thickness of 0.0179-inch, and depth required to fit insulation thickness indicated.

✓ Suspension Systems:
- Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch diameter wire, or double strand of 0.048-inch diameter wire.
- Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16-inch in diameter.
- Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538-inch and minimum 1/2-inch wide flanges.

✓ Furring Channels (Furring Members):
- Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch wide flanges, 3/4-inch deep.
- Steel Studs and Runners: ASTM C 645, minimum 0.0179-inch.
- Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8-inch deep.

✓ Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

✓ Provide ceiling and wall access doors as required, complete with cylinder locks compatible with bi-lock cylinders. Manufacturer's standard factory applied baked enamel primer and shall be field finished to match adjacent materials.
- Basis of Design: Milco, Cierra or approved equal.
- Ceiling access shall be provided for each room and at each equipment location.

4.4.4 Operable Partitions

Performance Requirements:

- Seismic Performance: Operable panel partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and as determined by the Design Team per applicable codes.
- Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
  - ✓ Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413.
  - ✓ Provide minimum STC 52.
- Fire-Test-Response Characteristics: Provide panels with finishes complying with one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - ✓ Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - Flame-Spread Index: 25 or less.
    - Smoke-Developed Index: 450 or less.

- ✓ Fire Growth Contribution: Complying with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.
- Operation: Manual, paired panels. Design shall provide for door recess and cover such the door pocket does not intrude into the combined room configuration.
- Panel Construction: Continuous 20 Gauge steel panel faces invisibly welded to minimum 16 gauge one-piece steel frames.
- Finishes: Color and texture chosen by the SFMTA from full range of Manufacturer fabrics.
- Acceptable Products: Moduflex Model 510PP fixed all of the used from 5.5 and on.

4.5 - Interior Glazing

Interior glazing shall be installed in prefinished aluminum or painted hollow metal frames. Glazing shall be minimum 1/4-inch thick laminated, heat strengthened glass. Glazing between conditioned and unheated spaces shall be insulated.

4.5.1 - Interior Doors

Interior doors in administrative, office type areas shall be solid core wood except where hollow metal (steel) doors are required to meet the fire rating of the partition or where doors are anticipated to receive heavy use such as corridors or restrooms. Office doors shall have minimum 12-inch wide sidelights. Frames for wood doors and sidelights shall be hollow metal. Interior aluminum frame glazed storefront doors shall be used at vestibules in administrative/office type areas. Refer to PR Section 5.3.13 Storefront, for additional information concerning storefront.

Doors in maintenance, shop, support and storage areas shall be hollow metal (steel) as described below. Doors and frames opening into areas of excessive moisture or into a corrosive environment shall be fiberglass reinforced structural shapes designed and finished for these conditions. Refer to PR Section 5.4 for descriptions and requirements on FRP Doors. Doors to mechanical rooms shall be hollow metal (steel) with hollow metal frames identical to those in the shop areas.

Cross corridor doors which are anticipated to remain closed shall have half lites unless restricted to a smaller area by fire ratings. Doors opening into areas in which a person may be expected to be in the area of the door swing shall have half lites.

All personnel doors on accessible routes shall comply with the Americans with Disabilities Act (ADA) Standards.

Where required, interior doors shall be coordinated with the security/intrusion detection/ access control system design for the facility.

Locking and keying systems shall be fully compatible with the SFMTA standard system. Interior door hardware finish shall be stainless steel. Stainless steel kick plates shall be provided at all maintenance and shop doors as well as restroom and stairwell doors.

4.5.2 - Interior Door Requirements and Warranties

Regulatory Requirements:

- Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- Smoke and Draft Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- Wood Doors:
  - ✓ Solid core wood doors clad with wood veneer faces, WDMA premium grade. Veneer to be selected by the SFMTA; book matched. Veneer face assembly-Running match.
  - ✓ Basis of Design: Heritage Collection VT Industries or approved equal.
- Hollow Metal Doors:
  - ✓ Office and Administration areas:
    - Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
    - Physical Performance: Level A according to SDI A250.4.
    - Minimum 16 gauge.
  - ✓ Shop, Support and Storage areas:
    - Maximum-Duty Doors and Frames: SDI A250.8, Level 4.
    - Physical Performance: Level A according to SDI A250.4.
    - Minimum 16 gauge.
    - Grouted frames will not be allowed.
  - ✓ Louvers: comply with SDI 111C.

- Finish: Doors and frames to be factory primed with galvalume primer compatible with top coats by the same manufacturer and then field painted with a high performance industrial coating as defined in Prescriptive Specification section 09 96 00, High-Performance Coatings.
- Glazing for Wood or Hollow Metal Doors: Provide ¼-inch thick minimum heat strengthened, laminated glass with a lifetime warranty.
- Hollow Metal Frames:
  - ✓ Minimum 14 gauge, fully welded.
  - ✓ Jamb Anchors:
    - Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042-inch thick, with corrugated or perforated straps not less than 2-inches wide by 10-inches long; or wire anchors not less than 0.177-inch thick.
    - Stud-Wall Type: Designed to engauge stud, welded to back of frames; not less than 0.042-inch thick.
  - ✓ Floor Anchors: Formed from same material as frames, minimum thickness of 0.042-inch, and as follows:
    - Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
    - Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
- Storefront doors:
  - ✓ Provide compatible non-insulated door from same manufacturer of storefront or curtainwall system selected. Refer to Section 5.3.13 Storefront for additional requirements.
- Overhead Coiling Doors
  - ✓ Insulated, motorized overhead coiling doors may be used at delivery and storage areas where applicable. Slats shall be stainless steel (minimum 22 gauge) or aluminum (minimum 18 gauge) and shall have a factory applied industrial quality finish. Doors must be provided with a lock with a master keyable cylinder that is compatible with the SFMTA standard system.
  - ✓ Warranty: minimum two (2) years from substantial completion.
  - ✓ Design Criteria:
    - Design Wind Load (where applicable): As determined by the Design Team per the applicable codes.
    - Deflection Limits (where applicable): Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
    - Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the appropriate component importance factor as determined by the Design Team per the applicable codes.
    - Operation Cycles: Door components and operators capable of operating for not less than 10,000 operation cycles (one cycle - door is opened from the closed position to the fully open position and returned to the closed position).
    - Air infiltration (applicable between conditioned and heated only spaces): maximum rate of 0.08 CFM/sf when tested according to ASTM E 283 or DAMSA 105.
    - Curtain R-value (applicable between conditioned and heated only spaces):as required by Energy Code, minimum R-7.
  - ✓ Operator:
    - Electric, Standard duty usage classification; rated for a maximum of 20 cycles per hour.
    - Safety Features: sensor edge and photoelectric eye, emergency manual chain hoist assembly, provide an integral motor mounted interlock system to prevent damage to door and operator.
    - Controls: surface mounted manufacturer standard button control interior, key access exterior.
  - ✓ Finish: factory applied powder coat.
  - ✓ Acceptable Product: (Insulated) Stormtite 625 by Overhead Door or approved equal; (Non-Insulated) Model 610 by Overhead Door or approved equal.
- Access Doors: Provide ceiling and wall access doors where required for service or maintenance, complete with cylinder locks compatible with the SFMTA standard lock system. Provide fire rated access doors and frames complying with NFPA 80 that are listed and labeled by a qualified testing agency for fire protection ratings required, according to NFPA 252 or UL 10B. All doors to have

manufacturer's standard factory applied powder coated primer and field painted to match adjacent materials.

- Special Door Requirements:
  - ✓ Doors providing access to the Telecommunication Rooms shall have replaceable gaskets, seals and sweeps at the jambs, head and sill to prevent the entry of dirt and debris.

4.5.3 - Interior Door Hardware

All door hardware sets and to be reviewed and approved by the SFMTA. Default hardware material shall be stainless steel. Alternate materials may be utilized with the SFMTA approval. Doors in fire-rated openings shall have hardware that is certified by Underwriters Laboratories (UL) or Warnock Hersey (WH).

At a minimum, provide the following standard sets of hardware for interior doors (single doors listed – adjust for pairs of doors accordingly):

- Storefront doors (vestibule): Offset Pivots (3 minimum), closer, push/pull set, stop.
- Personnel door (office area): Hinges (3 minimum), mortise lockset (secure) or mortise latchset (non-secure), stop, silencers.
- Hollow metal door (shop and office area perimeter): Hinges (3 minimum), mortise lockset (secure) or Mortise latchset (non-secure), closer, stop, kick plate or armor plate (materials handling), silencers, exit device (as required by code), entry/exit device (as applies), the SFMTA standard card reader access control system and/or intrusion detection alarm (as applies).
- Hollow metal Stair/Exit Door: Hinges (3 minimum), exit device, closer, stop, kick plate, silencers.
- Restrooms, Locker rooms: Hinges (3 minimum), push/pull, closer, stop, kick plate, mop plate, silencers.
- Custodial Rooms (Janitor Closet): Hinges (3 minimum), mortise lockset, stop, kick plate, mop plate, silencers

4.5.4 - Interior Joint Sealants and Firestopping

Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience. Joints shall be designed to meet the movement requirements for the installed conditions and shall present an aesthetic appearance that does not detract from the appearance of the building. The durability of the sealant shall also impact selection including aging characteristics, moisture, temperature, cyclic joint movement, movement during curing, and bio-degradation. Provide sealant backing or bond breaker as needed for specific applications. Provide mildew resistant sealants in wet areas.

Only sealants that have a current Validation Certificate from the SWRI (Sealant, Waterproofing & Restoration Institute) shall be utilized in the project. The Design Team shall confirm that all sealants selected meet the anticipated joint movement, are compatible with the materials they come in contact with and will adhere to the substrate(s) properly. Indicate joint locations, materials and spacing in construction document plans, elevations and details. Utilize sealants as follows:

- Latex (water based) sealants – acceptable for acoustic joints and firestopping systems as tested by UL Classified.
- Acrylic (solvent-based) sealants – acceptable for acoustic joints and firestopping systems as tested by UL Classified.
- Silicone sealants – acceptable sealant for plumbing fixtures, tile and stone applications and other porous and non-porous materials such as ceramic or stone panels.
- Polyurethane sealants – acceptable sealant for higher movement joints in concrete, masonry, metals, around window and door openings, expansion joints and other joints as approved by the sealant manufacturer.

Comply with joint sealant manufacturer's written instructions for products and applications indicated, unless more stringent requirements apply. Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

- Provide UL Classified firestopping systems at all penetrations and joints in or between Fire-Resistive Rated Construction complying with ASTM E 1966 or UL 2079.
- Provide fire-resistive joint systems in smoke barriers with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.
- Provide flame-spread and smoke-developed indexes for exposed joint firestopping systems of less than 25 and 450, respectively, as determined per ASTM E 84.
- Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install

elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

4.5.5- Expansion Control

Provide expansion control systems to accommodate building movement resulting from causes such as thermal change, seismic force or wind sway. Submit movement control diagrams addressing full structure. Submit calculations and rationale for joint locations, types and sizes. Expansion control elements shall match or be of a compatible color with the adjacent materials. Any exposed metal plates or covers shall be Type 316 stainless steel.

4.6 Interior Stairs

Communicating stairs in office and administration areas that are expected to be used on a daily basis shall be constructed of painted steel stringers with precast tread/riser units and landings or be fully pre-cast stair runs. The appearance of stairs in these areas shall be of a superior grade as approved by the SFMTA. Steel stairs used solely for egress and in shop and maintenance bay areas shall have precast tread/riser units or concrete filled metal pan treads with closed steel risers. All stair treads shall have a non-slip surface with a replaceable nosing consisting of an inset aluminum extrusion with abrasive anti-slip safety material. Open grating stairs will not be allowed. Epoxy connections for precast concrete treads will not be allowed.

Provide a minimum of one stair with direct access from the shop areas on the ground floor to the roof. This stair should have a fully enclosed interior landing and be protected by an enclosed penthouse with a hollow metal door. Daylight should be provided within this stairwell to the extent allowable by the design. Exterior shall be provided a landing level with the door threshold. Landing shall be minimum of 5-feet, 0-inches deep and full width of stairwell with a minimum overhead canopy of the same size. Provide lighting, recessed weatherproof receptacle and hose bib at this location. All exterior doors shall be coordinated with the security/intrusion detection/access control system design for the facility.

Provide factory assembled stair units, fabricated by a firm or shop experienced and skilled in custom fabrication and construction of metal stairs and railings (as applies).

- Treads and risers for steel pan stairs: minimum 14 gauge steel.
- Landings for steel pan stairs: minimum 12 gauge.
- Stringers: steel channels or tubes, size and gauge to suite span and stair width.

4.6.1 Handrail Construction

All handrails (including supports) and top rails of guardrails shall be stainless steel 316 with random orbital finish.

4.7 Interior Wall Finishes

Wall finishes shall be selected on the basis of durability and low maintenance and shall comply with sustainability requirements for low-emitting materials. Finishes shall be aesthetically pleasing and appropriate to the building's function.

4.7.1 Wall Finish Requirements

- Paint:
  - ✓ Paint systems shall be designed for application on the partition or wall substrate and shall be designated by MPI (Master Painters Institute) numbers. All systems shall meet or exceed MPI Premium Grade.
- Tile (excluding shower stalls):
  - ✓ Full wall height. Minimum of two colors to provide field and accent.
  - ✓ Install in compliance with the latest edition of the Tile Council of North America (TCNA) recommendations. For metal stud walls with cement board substrate utilize method W241. For masonry or concrete walls utilize method W211. Provide a waterproof membrane (A118.10) typical.
  - ✓ Glazed porcelain (ANSI 137.1), large format (Minimum 12-inches by 12-inches), 1/4-inch thick minimum.
  - ✓ Provide curved wall/floor cove and inside corners, bullnose, quarter round and any other special shapes required for smooth transitions and ease of cleaning. Color and type shall be chosen from Price Group 2 or greater and approved by the SFMTA.
  - ✓ Grout: low VOC, to inhibit the growth of mold and mildew, and meet ANSI A118.3. Provide Laticrete "Spectra-Loc" or approved equal.
- Tile (Shower stalls):
  - ✓ Full wall height. Minimum of two colors to provide field and accent.
  - ✓ Install in compliance with the latest edition of the Tile Council of North America (TCNA) recommendations. For metal stud walls with cement board substrate and mortar bed floor tile utilize method B415. For masonry or concrete walls utilize method B422. Provide a waterproof membrane (A108.13) typical. Complete

waterproofing is required including treatment at termination points.
- ✓ Glazed porcelain (ANSI 137.1), large format (Minimum 12-inches by 12-inches), 1/4-inch thick, price Group 2 or greater.
- ✓ Trim units: bullnose at external corners.
- ✓ Grout: low VOC, to inhibit the growth of mold and mildew, and meet ANSI A118.3.
- ✓ Provide Laticrete “Spectra-Loc” or approved equal.

- Wall Protection:
  - ✓ Provide minimum 16 gauge type 316 stainless steel corner guards with minimum 3-inch wings, 4-fee 0-inches high (minimum) at all outside corners. Mounted from top of rubber base, radius corners, beveled pre-drilled holes. Attach with SS screws.
- Stainless Steel Wall Panels: Provide minimum 18 gauge Type 316 with No. 4 satin finish. Maximize panel size for installation location. Screw mount panels unless otherwise directed.

4.7.2 Steel Finishes

Exposed structural steel, steel handrails, exposed piping and conduit and associated supports shall be painted construction and finishing.

4.7.3 Floor Finishes

Floor finishes shall be selected on the basis of durability, low maintenance and shall be easily replaceable. They shall comply with sustainability requirements for low-emitting materials. Floor finishes are listed by room on the Room Data Sheets found in Section Five. Finishes selected shall require. Provide stainless steel transitions at all changes in flooring material. Provide maintenance materials for each floor type selected: five (5) full unopened boxes.

4.7.4 Floor Finish Requirements

Natural Concrete:

- Provide Euclid Surflex Light-Reflective Dry Shake Hardener sealed with Euclid Euco Diamond Hard or approved equal.
- Integrally Colored Ground and Polished Concrete:
  - ✓ Concrete to be mixed, placed and finished in compliance with “CPAA Recommendations for the Design, Specification, and Placement of Concrete Floor Slabs” from the Concrete Polishing Association of America.
- Color, aggregate size and polish level as selected and approved by the SFMTA.
- Mockup: at a location selected by the SFMTA place and finish a 10-feet by 10-feet area in compliance with “CPAA Recommendations for the Design, Specification, and Placement of Concrete Floor Slabs”.
- Installer shall have 5 years minimum experience with work of similar scope and quality and shall be a CPAA certified applicator.
- Acceptable Manufacturer: L.M. Scofield Company. Provide a complete system from one manufacturer including but not limited to colored admixture, curing and sealing compound, chemical hardener/densifier and curing compound for polished concrete.

Walk Off Mats:

- Provide walk off mats at all entrances and at transitions between the shop or storage areas and office/administration areas. Textured patterned loop, 100 percent type 6.6 nylon. Provide ‘Recourse II’ by Mannington Commercial or approved equal.
- Carpet Tile: Must comply with the specification developed by the San Francisco Department of the Environment, dated June 8, 2018.
- Resilient Flooring:
  - ✓ Rubber Tile: Performance Requirements:
    - Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
    - Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
    - Minimum 0.100-inch (2.54 mm) thick. Seams shall be chemically welded. Rubber tile selected shall be certified compliant with the “FloorScore” standard. Flooring adhesives shall be low VOC and shall meet the Carpet and Rug Institute Standard and “Green Label” program.
    - Provide: Endura Simply Smooth Flexibles by Burke or approved equal.
    - Rubber tile at Fitness area: Resilient Ecofitness Multifunctional Athletic Robber Flooring by Burke or approved equal.
- Linoleum Tile:
  - ✓ Minimum 2.5 mm (0.10-inch) thick, manufacturer standard size (minimum 10-inches by 10-inches).
  - ✓ Type II with polyester backing.
  - ✓ Heat welded seams.

- ✓ Warranty period: minimum five (5) years from date of Substantial Completion.
- ✓ Basis of Design: Modular Tile Linoleum Tile by Marmoleum or approved equal.

• Resilient Base:
- ✓ ASTM F 1861 Type TS Rubber, Thermoset, Group I, minimum 4-inches high, 0.125-inch thick Floor Score Certified.

• Porcelain Tile :
- ✓ Interior floor tile to be unglazed through body porcelain, minimum 1/4-inch thick, price Group 2 or greater. Provide all trim units: cove base, bullnose at external and internal corners, etc.
- ✓ Install in compliance with the latest edition of the TCNA recommendations. Utilize method F114 with a cleavage membrane.
- ✓ Tiles shall comply with ANSI A137.1 and have color extending uniformly through the body of the tile and provide a 0.5 percent maximum water absorption in accordance with ASTM C737.
- ✓ Class Three (3) Commercial Medium to Heavy Traffic classification as rated by the manufacturer when tested in accordance with ASTM C1027-99 for visible abrasion resistance as related to foot traffic.
- ✓ MOH Scale Rating of 7 or greater.
- ✓ Slope tile floors to drain.
- ✓ Provide expansion, control and isolation joints as needed to accommodate movement and maintain tile assembly integrity. Follow TCNA EJ171 Movement Joint Guidelines.
- ✓ Provide waterproof membrane in shower areas in accordance with ANSI A118.10.
- ✓ Wet Dynamic Coefficient of Friction (DCOF): For tile installed on horizontal surfaces, provide products with the following values as determined by testing identical products per ANSI A137.1 Section 9.6 DCOF: minimum 0.60.
- ✓ Grout: low VOC, to inhibit the growth of mold and mildew, and meet ANSI A118.3.
- ✓ Provide Laticrete “Spectra-Loc” or approved equal.

• Tile and installation requirements for Shower stalls:
- ✓ Install in compliance with the latest edition of the TCNA recommendations. For tile shower receptor utilize method B415 with a waterproof membrane. Terrazzo tile receptors may be utilized with the SFMTA approval. Complete waterproofing is required including treatment at termination points.
- ✓ Tiles shall comply with ANSI A137.1 and have color extending uniformly through the body of the tile and provide a 0.5 percent maximum water absorption in accordance with ASTM C737.
- ✓ Class Three (3) Commercial Medium to Heavy Traffic classification as rated by the manufacturer when tested in accordance with ASTM C1027-99 for visible abrasion resistance as related to foot traffic.
- ✓ MOH Scale Rating of 7 or greater.
- ✓ Slope tile floors to drain.
- ✓ ADA compliant shower stalls shall slope to a trench drain at the back of the stall.
- ✓ Provide integral soap dish.
- ✓ Provide expansion, control and isolation joints as needed to accommodate movement and maintain tile assembly integrity. Follow TCNA EJ171 Movement Joint Guidelines.
- ✓ Provide waterproof membrane in accordance with ANSI A118.10.
- ✓ DCOF: For tile installed on horizontal surfaces, provide products with the following values as determined by testing identical products per ANSI A137.1 Section 9.6 DCOF: Minimum 0.60.

4.7.5 Ceiling Finishes

Durability and ease of maintenance and access shall drive the selection of ceiling finishes. Sustainability requirements for low-emitting materials and environmental product disclosure shall be followed. Ceilings with recycled content are preferred, but must meet performance criteria listed below. Acoustic properties of materials shall be considered and finishes shall be selected that reduce reverberation and noise to the greatest extent possible.

Coordination shall be required with security and communications systems and ceilings shall be designed to allow or prevent access to critical elements as needed by those systems. Access to mechanical, plumbing and electrical equipment requiring service or maintenance shall be designed into the selected ceiling systems. Ceiling access shall be provided for each room and at each equipment location.

Ceilings in maintenance bays, shops and associated storage, and the truck wash area shall be open to the deck. Exposed structural steel structure and deck, exposed piping, conduit, raceways and shall be painted.

Exposed insulation will not be allowed.

4.7.6 Acoustical Ceiling

- Tile size: 24-inches by 24-inches by (min) 3/4-inch
  - ✓ Armstrong Ultima Square or Beveled Tegular or approved equal.
- Suspension system:
  - ✓ Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation.
  - ✓ Prelude XL, Exposed Tee or approved equal.

4.7.7 Gypsum Board Ceilings

Performance Requirements:

- Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly according to ASTM E 119 by an independent testing agency.
- Attach all gypsum board to supports in accordance with the Northwest Wall and Ceiling Bureau (NWCB) Specification Standards Manual and ASTM C840.
- Paper faced gypsum board will not be allowed.
- Gypsum Board Type X: ASTM C 1396/C 1396M, 5/8-inch.
  - ✓ Basis of Design: DensArmor Plus Fireguard High Performance Interior Panel.

4.7.8 Interior Signage

Provide room identification signage for all rooms and spaces within the facility per the SFMTA Guidelines. Signage shall comply with applicable provisions of the ADA guidelines and include room numbers and names. Office spaces and other spaces as directed by the SFMTA shall have interchangeable inserts. Signage in shop areas to be made of highly durable material and shall be mechanically attached to the wall with non-corrosive fasteners compatible with the material joined (adhesive attachment will be unacceptable). Room identification signage shall be consistent in appearance throughout the building. Wayfinding signage shall be provided to facilitate access to all areas of the building.

Furnish and install all signage, required mounting and associated structural supports or backing for signage. Signage designs and locations shall be coordinated, reviewed and approved by the SFMTA prior to fabrication and installation. An approved sign location plan is required prior to the 100 percent review. The SFMTA interior signage shall include:

- Code mandated signage (including hazardous areas, safety, egress and accessibility).
- Room signage: for all rooms and spaces within the facility.
- Wayfinding Signage: clearly identify circulation routes to all areas of the facility.
- Operational signage: as directed by the SFMTA Operations.

Signage shall be designed to be architecturally compatible with the building and shall contribute to the overall character of the facility.

4.7.9 Specialties

- Visual Display Units: Provide visual display units in conference rooms, training rooms, and lunch/break rooms. Provide marker boards and tack boards or combination units containing both marker boards and tack boards. Provide marker boards with chalk trays with lifetime surface warranty.
- Storage Shelving: Provide storage shelving as required in equipment schedule and specified here in.
- Toilet and Bath Accessories: Provide toilet and bath accessories fabricated from stainless steel. Provide paper towel dispensers, waste receptacles, toilet tissue dispensers, soap dispensers, grab bars, sanitary napkin dispensers and disposal units, shower curtains, hair dryers, mirrors, and clothes hooks, as required for convenient and efficient use of toilet and bath facilities. Provide mop sink and mop plus broom holder with shelf in custodial closets.
- Projection Screens: Provide ceiling recess mounted electrically operated projection screen in the Training Room. Screen material suitable for video projector, minimum screen size 5-feet by 7-feet.

4.7.10 Millwork

Refer to Room Data Sheets for millwork locations and general requirements. Provide AWI (Architectural Woodwork Institute) custom grade millwork, concealed hinges, and adjustable shelf standards. All hardware shall be stainless steel.

Exposed millwork surfaces shall be ANSI/ NEMA LD3 high pressure plastic laminate with plastic laminate covered edges. Melamine interior finish will not be acceptable.

Horizontal surfaces other than countertops, the vertical surfaces, and the edges shall be Grade HGS.

Semi-Exposed Surfaces excluding drawer bodies shall be Grade VGS. The drawer sides and backs shall be solid hardwood lumber. The drawer bottom shall be constructed with hardwood plywood.

Countertop (all locations except Dispatch) shall be constructed with solid surface with integral backsplash. Dispatch countertop shall be minimum 16 gauge in thickness, Type 304 stainless steel, non-directional matte finish and with the eased edge.

Miscellaneous millwork included but not limited to shelving in the maintenance library, media and storage rooms shall be directed by SFMTA. Shelving shall be plastic laminate cladded and supported by standards and brackets for the expected loading.

For bonding laminate to core, PVA adhesive for cold press applications shall be machine applied as a consistent, rigid glue line. Use adhesives that comply with VOC content limits according to EPA Method 24, 40- CFR-59, Subpart D, wood glues with VOC content less than 30 g/L. VOC contents of the adhesive shall be 70 g/L or less. Added urea-formaldehyde in materials or fabrication is not allowed in assemblies.

4.8 Conveying - Elevators

- Personnel elevators: Provide elevator by Fujitec, KONE, Schindler, Thyssen, Cantonor approved equal. Passenger elevator features:
  - ✓ Capacity: 3,000 pounds.
  - ✓ Speed: per PPC and the SFMTA
  - ✓ Car Interior and Hall Doors and Frames: Stainless steel, minimum 14 gauge. Sound deaden doors and frames.
  - ✓ Emergency Return Unit: A battery powered lowering unit shall be provided to automatically return the elevator to its lowest landing at normal speed in a power failure and allow all passengers to exit safely.
  - ✓ Floor Finish: Per PPC and the SFMTA
  - ✓ System Startup: PPC to obtain and pay for permit, license, and inspection fee necessary to complete the installation.
  - ✓ Power Characteristics: 480 V, 3 phase, 60 hertz.
  - ✓ Minimum Clear Inside Car: minimum 6-feet 8-inches wide by 4-feet 9-inches deep by 8-feet high clear.
  - ✓ PPC shall submit 3-inch by 12-inch samples of actual finished material for review of color, pattern, and texture of exposed finishes.
- Freight elevators: Provide elevator by ThyssenKrupp, Otis, Schindler or Kone. Freight elevators shall meet all codes referenced therein. Selection of the elevator type (electric or hydraulic) shall be made based on the required performance and shall be subject to review and approval by the SFMTA.
  - ✓ Access to the freight elevator shall be provided on all bus yard component levels including the basement.
  - ✓ Loading and Capacity: Class C-1, minimum loading capacity of 10,000 pounds, designed to transport a loaded industrial truck with the maximum combined weight of industrial truck and load not to exceed 10,000 lbs.
  - ✓ Speed: 100 feet per minute (minimum).
  - ✓ Clear Inside Dimensions: minimum 8-feet wide by 13-feet 6-inches deep with minimum height to accommodate an electric forklift.
  - ✓ Operation: Simplex.
  - ✓ Emergency Return Unit: A battery powered lowering unit shall be provided to automatically return the elevator to its lowest landing at normal speed in a power failure and allow all passengers to exit safely.
  - ✓ Car Interior, Hall Doors, and Frames: stainless steel panels, minimum 14 gauge with No. 4 finish, flooring to be minimum 3/16 inch steel checker plate.
  - ✓ Additional features: wire mesh car gate, stainless steel bumpers, buttons for cab protection pads.
  - ✓ Provide an associated machine room as required by elevator manufacturer.
  - ✓ System Startup: PPC to obtain and pay for permit, license, and inspection fee necessary to complete the installation.
  - ✓ Power Characteristics: 480 V, 3 phase, 60 hertz.
- Major elevator components, including driving machines or pump and tank units and plunger-cylinder assemblies (as applicable), controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by a single manufacturer. Elevators shall be installed by the elevator manufacturer or an authorized representative who is trained and approved by the manufacturer.
- Elevators shall be fully accessible to individuals with disabilities, meeting all requirements of the ADA Guidelines.
- A minimum 2 year warranty from the date of Acceptance shall be provided in which Manufacturer agrees to repair, restore or replace elevator work that fails in materials or workmanship within the specified period. Failures include but are not limited to, operation or control system failure, including

excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

- Traveler Cable - Systems to elevator shall be provided via a traveler cable meeting the following requirements:
  - ✓ Terminate in a communications compartment/access panel on the rear wall accessible inside the car to hold communications equipment.
  - ✓ Carry compartment power for router and devices.
  - ✓ Wire-way from compartment to devices.
  - ✓ Router inside the communications compartment.
  - ✓ Router consolidates CCTV, ACS, phone if IP Phone.
  - ✓ Traveler cable to include Plastic Optic Fiber (POF) cable for IP communications to the Router. Use a POF fiber bundle in a sheath rated for Continuous-Bending. POF shall be rated for at least 5,000,000 (five million) Continuous-Bending cycles. POF fiber may be multi-mode or single mode. Terminate 1 pair of POF at elevator distribution cabinet and elevator cab systems. Leave remaining pairs unterminated in elevator and in elevator machine room.
  - ✓ Provide four pairs of spare communication wires in addition to those required to connect specified items. Tag the spares in the machine room.

4.9 Plumbing

General:

The PPC shall design, permit, and construct all plumbing systems. All work shall be in accordance with the California Building and Plumbing Codes with City and County of San Francisco amendments, local codes, and any criteria listed in this document.

The PPC shall be responsible for verifying achievement of goals at each progress design deliverable and at permit.

All water and gas piping penetrations through concrete or masonry shall have a metallic pipe sleeve. Sleeves at floor penetrations shall extend at least 12 inches above slab. Seal all wall and floor penetrations.

Provide pipe labels for all piping every 50 feet and change of direction indicating size, content, and flow of direction.

Seismic-restraint systems shall comply with California Building Code with local amendment requirements. Refer to structural for wind- and seismic-restraint loading requirements.

4.9.1 Plumbing Piping

Potable Domestic Water:

Potable domestic water mains and new supply lines shall be installed at least 4-feet horizontally from, and one-foot vertically above a parallel pipeline conveying recycled water. The water main shall not be in the bus driveways.

Domestic water piping 3-inches and larger below the slab shall be ductile iron and piping 2-1/2-inches and less shall be ASTM B88 Type K soft copper with no joints or silver brazed joints. Above floor piping shall be ASTM B88 Type L hard copper with lead-free soldered or pressure-sealed joints. Push-on and drilled joints are prohibited. All buried domestic water pipe below slab shall be protected with 20 mil polyethylene wrap and tape and pipe sleeve at slab penetration. Hydrostatically test water piping to 100 PSI or 150 percent of operating pressure. Maintain pressure for not less than four hours.

Potable domestic water service must comply with the CCSF Plumbing Code and Health Code. Provide with a strainer and lead-free reduced pressure backflow preventer with secondary, utility grade remote reading water meter. The pulse meter shall be connected to the building automation system (BAS). The supply line to each item of equipment or fixture shall be equipped with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with the operation of other equipment or fixtures. Supply piping to reels, wall hydrants and equipment shall be anchored to prevent movement.

Domestic hot water piping shall be insulated.

Domestic water shall be sized to provide a minimum of 25 PSI at flush valves and 15 PSI at other fixtures. Sizing shall comply with the requirements of the California Plumbing code. Velocities with the main and branch piping shall not exceed 6 fps.

Domestic water valves 4-inches and larger shall be OS&Y gate valves type with cast iron body and bronze mounted trim type MSS SP-70 rated for a minimum of 175 PSI. Valves 3-inches and less shall be bronze ball type MSS SP-110 rated for a minimum of 400 PSI. All potable domestic water valves shall be lead free.

Water sub metering shall be installed to monitor consumption of water uses including, but not limited to, individual monitoring of each

vehicle or equipment wash area, shop area, irrigation system and all exterior hose bibs. Each sub meter shall be connected to the BAS.

4.9.2 Recycled Water

Recycled water piping shall be purple PVC or equivalent with SFPUC's City Distribution Division sign off, prior to installation.

The potable water line may be used to feed the recycled water lines(s) until such time that recycled water becomes available. When recycled water becomes available, the cross-connection will be broken by the SFPUC, and the potable and recycled water lines will be totally separated. Before recycled water is delivered to the property, cross-connection and backflow testing will take place to assure separation.

Connect water closet and urinal flushing and wash water system to metered recycled water system.Provide additional pulse meters for the boiler make-up water and wash water systems make-up water. Any irrigation systems shall have a dedicated recycled water tap with a separate meter. All meters shall connect to BAS.

4.9.3 Sanitary and Oily Waste and Vent

Sanitary/oily waste and vent piping shall be no-hub cast iron pipe and fittings.

4.9.4 Storm Drain

Storm drain piping that is not visible from the exterior of the building shall be no-hub cast iron pipe and fittings. Exterior storm piping shall be stainless steel, unless otherwise authorized by the SFMTA.

4.9.5 Waste Water Force Main

Waste water force main piping shall be ASTM B88 Type K hard copper with silver brazed joints. Above floor piping shall be ASTM B88 Type L hard copper with lead-free soldered joints.

4.9.6 Plumbing Fixtures

- Water closets shall be wall mounted with flush valve and elongated bowl and chair carrier. Water closet and flush valve shall be HET at 1.1 GPF with a MaP rating of 1000 as tested by Veritec Consulting, Inc. Flush valve shall be exposed, hydraulically powered, electronic sensor operated type with additional manual flush. Water closets and flush valves shall be suitable for use with recycled water.
- Urinals will be wall mounted flush valve type with carrier. Urinal and flush valve will be HEU at 0.125 GPF. Flush valve will be exposed, hydraulically powered, electronic sensor operated type with additional manual flush. Urinals and flush valves shall be suitable for use with recycled water.
- Lavatory will be white vitreous china, under counter mounted or wall mounted with chair carrier. Faucets will be hydraulically powered, electronic sensor operated, heavy-duty cast brass institutional grade with maximum flow rate of 0.5 GPM. Lavatory faucets shall comply with ASSE 1070.
- Sink in Break Rooms will be double compartment, under counter mounted, 18-gauge stainless steel. Faucets will be manual operated, heavy-duty cast brass institutional grade with maximum flow rate of 1.0 GPM. Sinks shall be provided with garbage disposer.
- Sink in Coffee Bars will be single compartment, under counter mounted, 18-gauge stainless steel. Faucets will be manual operated, heavy-duty cast brass institutional grade with maximum flow rate of 1.0 GPM.
- Showers will be provided with heavy-duty pressure balancing type mixing valve. Shower heads will be 1.5 GPM flow. Hand held shower heads for the handicapped will be 1.5 GPM flow.
- Electric water coolers will be dual height and constructed of stainless steel lead-free and with an integral filter and bottle filler.
- Wash fountains will be multi-station and constructed of stainless steel or precast terrazzo. Each station will be 0.5 GPM flow.
- Janitor's mop sink will be floor type constructed of precast terrazzo. Faucet will be manual operated heavy-duty cast brass institutional grade, wall mounted with support bracket, vacuum breaker with hose end spout with maximum flow rate of 2.2 GPM.
- Combination emergency/shower eyewashes shall be exposed type with floor flange, galvanized steel piping plastic shower head actuated by a stay open ball valve with rigid pull rod and handle, eyewash with large stainless steel bowl and two soft stream heads actuated by stay open ball valve with push flag. Unit will be provided with manufacturer's recommended thermostatic mixing valve to provide tepid (60 degrees to 90 degrees F) water in accordance with ANSI Z358.1 and local audio/visual alarm tied into the BAS. Minimum size for thermostatic mixing valve will be 44 GPM with a maximum pressure drop of 20 PSI. Pipe sizes will be 1-1/4-inch water inlet and 1-1/4-inch drain. Combination emergency shower/eyewashes

shall be located throughout the maintenance areas in accordance with OSHA eyewash requirements. All emergency showers/ eyewashes shall be floor drain.

- Emergency eyewashes shall be exposed type with floor flange, galvanized steel piping with large stainless steel bowl and two soft stream heads actuated by stay open ball valve with push flag. Unit will be provided with manufacturer's recommended thermostatic mixing valve to provide tepid (60 degrees to 90 degrees F) water in accordance with ANSI Z358.1 and local audio/visual alarm tied into the BAS. Minimum size for thermostatic mixing valve will be 5 GPM with a maximum pressure drop of 20 PSI. Pipe sizes will be 3/4-inch water inlet and 1-1/4-inch drain. Emergency eyewashes shall be located on the mezzanines. All emergency eye washes shall be hard plumbed and with floor drain.
- Exposed plumbing fixture trim shall be chrome plated.
- Trap primers shall be ASSE 1018 supply-type, trap-seal primer. Trap seals shall be ASSE 1072 certified waterless in-line drain trap seals at each drain outlet.
- Water hammer arrestors shall be properly applied to the domestic hot and cold water systems for all plumbing fixtures in accordance with ASSE 1010.
- Handicapped plumbing fixtures shall be provided in accordance with ADA.

4.9.7 Plumbing Specialties

- Roof drains with overflow roof drains and roof clamps shall be provided. Roof drain system shall be sized for 1.5-inches of rainfall per hour. Storm water piping shall be no-hub cast iron above grade and HDPE below grade.
- Floor drains shall be provided in Restrooms, Showers, Changing areas, Custodial Rooms (Janitors Closets). Floor sinks shall be provided at each emergency showers/ eyewashes, emergency eyewashes and Mechanical Rooms adjacent to water heaters, boilers, air compressors, HVAC units, and pumps. Reduced pressure backflow preventers shall be provided with a floor sink drain. Floor sinks for condensing domestic water heaters and boilers shall have a cast iron body and 13-inch square slotted heavy duty grate with acid resisting epoxy coated interior and top, with anti-splash interior dome strainer.
- Floor drain grates and frames in Restrooms, Showers and Custodial Rooms (Janitors Closets) shall be light duty with nickel bronze or stainless steel 6-inches grates. Floor sinks at mechanical rooms, water heaters, boilers and emergency showers/eyewashes and emergency eyewashes shall have a cast iron body and 13-inch square slotted heavy duty grate with acid resisting epoxy coated interior and top, with anti-splash interior dome strainer. Full grate configuration and emergency showers/eyewashes and emergency eyewashes. Grate configuration for mechanical rooms shall be suitable for installation requirements.
- Floor drains in shop areas subject to wheel traffic shall be heavy-duty with 8-inch nickel bronze or stainless steel tractor grate.
- Trench drains shall be provided in lower level work areas, wash areas and overhead door openings. Grates shall be Load Class D / H-20 rated for extra heavy duty.
- Floor drains and floor sinks shall be provided with trap protection device. Trench drains shall have sediment baskets installed upstream of traps.
- Elevator pits shall be provided with sumps and sump pumps. Hydraulic elevator pumps shall discharge through an oil-water separator before discharge into the sanitary system. Provide a high level alarms for sump pump fail.
- Exterior freeze proof wall hydrants shall be box type and provided around the perimeter of each building at each man door. Non-freeze interior hose bibs shall be provided around the perimeter of the interior shop areas at 150-feet or less intervals, in lower level work areas, Restrooms and Mechanical Rooms.
- Compressed air drops shall be provided as indicated in the design criteria. Compressed air piping shall be Type L copper. Provide full-port, metal ball valves suitable for use with compressed air at all equipment to provide positive shut off, low leakage valves rated at 150 PSI suitable for piping without dielectric fittings. Provide pressure regulators, filters, quick connect couplings and accessories as required. Label piping and pressure test at 200 PSI for four hours.
- Water hammer arrestors shall be provided on the domestic cold and hot water systems in accordance with PDI Standard WH-201. Water hammer arrestors shall be all stainless steel when installed in non-accessible locations. Provide water hammer arrestors at all solenoid valves.
- In the wash bay, provide provisions to safely and easily wash the forehead of the vehicles.

4.9.8 Plumbing Equipment

Domestic Water Heater and Accessories:

Each building will be provided with a central domestic water heating system located in the Main Mechanical Room. Water heaters will be commercial vertical ASME tank type with 400 series stainless steel or stainless steel alloy tank, 98 percent energy efficiency, low NOx rated, direct vent and sealed combustion chamber, with CPVC combustion intake and stainless steel flue vent piping.

Central domestic water heating systems shall include high/low flow thermostatic mixing valve(s) and a domestic hot water circulation pump(s)to maintain adequate temperature in the hot water circulation system throughout the building. Domestic water heating systems shall heat water to 140 degrees F and thermostatic mixing valve will be provided to temper water supply temperature down to 110 degrees F for distribution. Showers will be limited to 105 degrees F. Hot water circulation will be within a reasonable time frame from the fixture.

Central domestic hot water system shall be provided with in-line domestic hot water circulation pump to provide hot water to the fixtures within 15 seconds.

Elevator Pumps:

Each elevator shall be provided with and elevator sump and duplex pump to pump out accumulated water. Pump shall discharge to a minimum size of 6-inch industrial waste sewer pipe.

Sand and Oil Interceptor:

All maintenance shop, wash area, etc., floor and trench drains, and elevator sump that have the possibility of receiving oily drainage shall be piped to an exterior sand and oil interceptor prior to entering the site sanitary sewer system. Oil interceptor shall be sized in accordance with the Plumbing Code. Interceptor shall be precast concrete located in an accessible area for servicing.

Waste Water Lift Station:

If the waste water drainage piping systems inside the buildings are unable to connect to the site sanitary sewer piping system elevation, a waste water lift stations shall be provided. Waste water lift stations shall consist of duplex ejector pumps each sized at 100 percent of the peak load in a wet well and a separate valve vault. Duplex pumps shall alternate starts and both have the capability to run simultaneously upon rising level. Pumps shall be controlled by float switches. For ease of maintenance pumps shall be provide with stainless steel rail retrieval system. Waste water lift station shall be connected to the emergency generator. A diesel-fueled engine generator set shall provide power for the emergency/standby system loads.

4.10 HVAC

General:

The PPC shall design, permit, and construct all HVAC systems. All work shall be in accordance with the City and County of San Francisco, local codes and any criteria listed in this document.

The performance goals depend on the level of insulation added to the building envelope and final glazing choice. The PPC shall be responsible for verifying achievement of goals at each progress design deliverable and at permit. Title 24 requires HVAC design use the 0.4 percent ASHRAE design conditions for the current year. These design conditions may be exceeded for a number of hours per year (due to outside temperatures exceeding the ASHRAE 0.4 percent design conditions.) While designing to the ASHRAE 0.4 percent conditions by definition indicates that design set points will be exceeded during peak periods, typical design often requires a minimal amount of over sizing so that control is always maintained.

The SFMTA shall assist the Commissioning Provider in the development and implementation of a commissioning plan for LEED compliance.

Seismic-restraint systems shall comply with California Building Code requirements. Refer to structural for wind- and seismic-restraint loading requirements.

Each area within the Bus Yard shall be evaluated for hazardous area classification following NFPA Section 497 and NEC Sections 500-516. HVAC equipment located within each space shall be explosion-proof if relevant for the class designation (Class I, II, or III). Particular areas of concern include those where cleaning or fuel chemicals will be stored or used.

Air handling units may be either indoor or rooftop mounted and shall be located on rooftops or in enclosures with adequate ducting to intake and exhaust to enable effective operation per the manufacturer conditions. Air handlers must incorporate airside economizers as noted in the DCD. The PPC shall propose the area required for air handlers based on ventilation requirements listed in the DCD, and propose locations for air handlers as part of the response.

Exhaust air ducts for air handlers and direct environmental exhaust from maintenance and other spaces shall not terminate within 3’ of a property boundary or opening of the building or 10’ from a forced air inlet, per CMC Section

502.2.1. Backdraft or motorized dampers are required for all exhaust openings.

Exhaust fans, air handling units, and other mechanical equipment shall be readily accessible for maintenance. Equipment installed above a ceiling must have adequate access through access panels for routine maintenance. Rooftop equipment must be provided with adequate access via a stairwell and at least 5' clearance around the equipment with a walking path. Access shall be limited to only maintenance personnel via secured openings (doors, access panels, etc.). Fans and motors weighing more than 200 pounds shall have full-length hoist rails mounted over the equipment to facilitate service, removal, and replacement.

The Site is located within an area with elevated pollution concentrations designated by the City as an Air Pollutant Exposure Zone (APEZ). As defined in San Francisco Health Code Article 38, this requires residential buildings and other sensitive uses to comply with an enhanced ventilation requirement. All residential units and other sensitive use spaces as defined in Article 38 must be provided with a ventilation system capable of achieving PM2.5 protection equivalent to that associated with MERV 13 filtration, as defined by ASHRAE Standard 52.2.

- RFP phase: Proposers shall indicate in their proposed design how they will achieve compliance with Article 38 requirements and demonstrate how compliance is expected to be met.
- PDA phase: To ensure compliance with the intent of this article, and to limit impact from potential pollution sources generated on-site at the Facility, the design team shall undertake a CFD evaluation of impact to at least one residential unit per façade. CFD analysis shall indicate the concentration of different particulate matter sizes developed in the unit and determine the equivalent MERV rating based on ASHRAE Standard 52.2. Mitigations shall then be determined to achieve a minimum MERV 13 compliance.
- Based on the results of this analysis during the PDA phase, the PPC shall be responsible for creating a ventilation plan demonstrating compliance with this article, and submitting it to the San Francisco Department of Public Health for review and approval prior to submitting mechanical drawings for approval. Plans must indicate the path of outdoor air and filtration, impact of z-ducts, trickle vents, or other unfiltered air intakes to units, and strategies for common areas of residential units (note that common areas do not require enhanced ventilation if positive pressure is maintained in adjacent units and habitable spaces). The submission shall also include the findings from the CFD analysis.

4.10.1 Codes and Standards

The following design conditions apply to all interior building types and uses, unless noted otherwise.

Load Calculations:

- Use Radiant Time Series calculation methodology for cooling. Do not use occupancy schedules for cooling system design.
- Do not use internal heating load sources (lights, receptacles, people) when calculating heating system design loads.
- Account for duct leakage in load calculations
- Account for fan heat in load calculations. Model fan static pressure at dirty filter condition.
- Energy modeling programs shall meet all requirements of the USGBC LEED rating program energy modeling requirements. Energy modeling program shall be able to fully simulate all 8,760 hours in a year. The energy modeling program shall be able to separately schedule occupancy, internal loads, lighting, fans, compressors, and other plant equipment. The energy program shall be able to breakout packaged equipment to model supply fan energy separately from packaged energy rates.

4.10.2 HVAC Systems for Cooled and Heated Spaces

Unacceptable Systems:

- Variable Refrigerant Flow systems are not acceptable because the system is proprietary once a specific manufacturer is selected and installed.
- Systems that utilize electric resistance heating as the primary heating source are prohibited.
- Ground source heat pumps and packaged terminal air-conditioners or heat pumps (PTAC/PTHP) are prohibited.
- Split-systems, except for isolated or remote rooms that require air-conditioning or heating and extending the main air or water distribution service is not cost effective.
- Baseboard, fan coil units or other floor-mounted equipment in occupied spaces. Local vertical fan coil units or heat pumps may be used if they are installed in mechanical closets.

4.10.3 System Notes

Systems that use terminal equipment as the primary cooling and air distribution source including, but not limited to fan-coil units, local heat pumps, chilled beams, etc. shall use a Dedicated Outdoor Air System (DOAS) to deliver outdoor air to occupied spaces. DOAS systems shall use exhaust air energy recovery utilizing total energy wheels. DOAS systems may deliver outdoor air to the return side of terminal devices or direct to space. DOAS units shall cool and dehumidify outdoor air to at least a 52 degrees F dew point prior to distribution to terminal devices or spaces. Provide filters upstream of the energy wheel in both airstreams. Outdoor air filters shall be minimum MERV 13. Exhaust air filters shall be minimum MERV 8. Supply fan motors and exhaust fan motors shall be driven with VFDs. Provide airflow stations in both the outdoor airstream and exhaust airstream and adjust fan speeds to maintain design airflow rates as filters load.

HVAC Zones - Up to four offices may be combined on one thermostat controller, provided the offices have identical solar, or the like, heat loading. If a corner office has two different window exposures, then provide a separate zone controller. Each conference room, training room, lounge or other similar room shall have its own zone controller.

4.10.4 HVAC Systems for Heated and Ventilated Spaces

Required Heating System:

In-floor radiant heating for maintenance bay areas and wash bays. Other storage rooms and shop rooms in the maintenance area may use forced air heat or overhead radiant heat.

Air Distribution System Design:

- Louvers:
  - ✓ The mechanical engineer shall select and specify louvers for all air associated with the HVAC system design.
  - ✓ Use wind-driven rain louvers.
  - ✓ Orient louvers so that prevailing winds do not oppose exhaust airflow to the maximum practical extent.
- Duct Design:
  - ✓ All ductwork shall be G90 galvanized steel except in areas where special requirements dictate aluminum or stainless steel duct construction.
  - ✓ Duct construction shall be in accordance with SMACNA HVAC Duct Construction Standards except that minimum duct thickness allowed shall be 24-gauge galvanized steel in all locations.
  - ✓ All duct systems shall be sealed to SMACNA Seal Class A.
  - ✓ Specify ducts to be constructed to the next higher pressure class than the maximum anticipated operating pressure.
  - ✓ Duct systems operating at a pressure class greater than 2-inches (positive and negative) shall be constructed of round or oval spiral seam ducts.
  - ✓ Duct elbows that have an air velocity exceeding 2,000 fpm shall have a radius/width ratio of 1.5. Duct elbows that have an air velocity less than 2,000 fpm shall have a radius/width ratio not less than 1.0. All mitered elbows with a turning angle greater than 30 degrees shall use single wall turning vanes. All tees shall include turning vanes. Branch duct taps shall be use low-loss fittings.
  - ✓ Acoustical duct liner shall be flexible elastomeric designed specifically for sound attenuation. Glass fiber or mineral fiber duct liner is not acceptable. Acoustical duct liner in ducts with an air velocity exceeding 2,000 fpm shall utilize double wall duct with a galvanized steel perforated duct liner. Acoustical duct liner in ducts with an air velocity less than 2,000 fpm may use single wall duct.
  - ✓ Duct insulation shall be flexible wrap with factory applied FSK jacket. Ducts located in high-abuse areas such as mechanical rooms shall be rigid board insulation with factory-applied ASJ.
  - ✓ All dampers that process outdoor air shall use 316 stainless steel dampers. Control actuators shall be mounted outside the airstream.
  - ✓ Outdoor air dampers, exhaust air dampers, and control dampers shall meet AMCA Publication 511 Class 1 leakage requirements.
  - ✓ Dampers at air-handling units mixing plenums and two-position dampers shall be parallel blade. All other control dampers and balancing dampers shall be opposed-blade.
  - ✓ Fire dampers shall be “blades out of airstream” type.
  - ✓ Balancing dampers shall be located in duct branch as far from the supply air terminal as possible.
- VAV Terminal Units:
  - ✓ Acceptable types are single duct shut-off and parallel fan-powered. Preference is for single duct shut-off due to additional

maintenance and noise concerns with fan-powered units. Fan-powered units if used shall only use electronically commutated fan motors. VAV units shall be pressure independent.
  - ✓ Select VAV units that can throttle to 20 percent of design airflow to reduce unnecessary reheat.
  - ✓ VAV units shall be double wall construction.
- Air Terminals:
  - ✓ All diffusers, registers, and grilles shall be aluminum construction.
  - ✓ Select air terminals with a high air diffusion performance index (ADPI) for the specific room.

Water Distribution System Design:

- Chilled Water Piping
  - ✓ Up to and including 2-inches – ASTM B88 Type L copper (use ASTM B88 Type K copper below grade)
  - ✓ 2-1/2-inches and larger – ASTM A53 Schedule 40 steel.
  - ✓ Pipe insulation – fiberglass, thickness as required by ASHRAE 90.1. Provide ASJ with vapor retarder on all chilled water piping. Chilled water piping greater than 1-1/4-inches located in unconditioned spaces and in all mechanical rooms shall use minimum 2-inch thick phenolic or 3-inch thick cellular glass. Chilled water piping 1-1/4-inches and smaller shall use 1-1/2-inch thick flexible elastomeric.
  - ✓ Pipe jacket – provide ASJ with vapor barrier in all locations. Provide PVC jacket in mechanical rooms and other areas subject to damage. Provide stainless steel jacket outdoors above grade.
- Chilled Water Condensate Piping
  - ✓ Up to and including 2-inches – ASTM B88 Type L copper (use ASTM B88 Type K copper below grade)
  - ✓ 2-1/2-inches and larger – ASTM A53 Schedule 40 steel.
  - ✓ Pipe insulation – fiberglass with ASJ and vapor barrier or flexible elastomeric. Thickness as required to prevent surface condensation. Provide cleanouts on high ends of condensate piping.
- Heating Water Piping
  - ✓ Up to and including 2-inches – ASTM B88 Type L copper (use ASTM B88 Type K copper below grade)
  - ✓ 2-1/2-inches and larger – ASTM A53 Schedule 40 steel.
  - ✓ Pipe insulation – fiberglass, thickness as required by ASHRAE 90.1. Provide ASJ with on all heating water piping.
  - ✓ Pipe jacket – provide ASJ in all locations. Provide PVC jacket in mechanical rooms and other areas subject to damage. Provide stainless steel jacket outdoors above grade.
- Radiant Floor Heating Piping
  - ✓ Cross-linked high density polyethylene (PEX) manufactured in accordance with ASTM F876 and ASTM F877. Radiant floor tubing shall carry a minimum 30-year warranty.
- Pipe Hangers
  - ✓ Provide clevis type hangers with insulation shield, minimum 12-inches long centered in hanger. Strut systems may also be provided with protective insulation shield.
  - ✓ Use pipe rollers, guides, and expansion loops as necessary to accommodate thermal expansion.
- Flow meters, Separators, and Expansion Tanks
  - ✓ Provide in-line electromagnetic type. Provide isolation valves on both sides of meter with minimum straight pipe distance recommended by flow meter manufacturer.
  - ✓ Provide air and dirt separator in chilled water and heating water systems at plant. Provide dirt separator in condenser water system. Provide isolation valves on both sides of separator.
  - ✓ Expansion tanks shall be welded steel closed bladder type, tested and stamped in accordance with ASME SEC VIII, rated for working pressure of 125 PSIG, with replaceable flexible heavy-duty bladder.

Refrigerant Distribution System Design:

- Refrigerant Piping shall be ACR copper.
- Pipe insulation – Flexible elastomeric, thickness as required by ASHRAE 90.1. Insulation both suction and gas piping separately.
- Pipe jacket – Provide PVC jacket in mechanical rooms and other areas subject to damage. Provide stainless steel jacket outdoors above grade.
- Use only brazed joints.

4.11 Equipment

General:

- All motors powered by variable frequency drives shall include a motor shaft grounding ring. All motors shall be premium efficient. Use direct drive motors where available

- Use electronically commutated motors in small, low power applications where available. Provide minimum 6-inch tall concrete housekeeping pads for major equipment
- Fouling factor for heating water heat-transfer coils shall be at least 0.00025 hr-ft, 2 degrees F/Btu.
- Provide buffer tanks if system water volume is below recommended minimum system values as directed by manufacturers.

4.11.1 Air-Cooled Chillers

Provide a factory assembled and tested, positive displacement packaged chiller. Design for primary variable flow to avoid unnecessary constant volume pump energy.Select chillers that maximize IPLV. Select chillers that have minimum turndown of 25 percent or lower. Provide chiller with the following features: Factory installed evaporator flow switch. Provide condenser coil with factory applied coating to protect against salt water corrosion. Air cooled chillers to be provided with these features.

- Microchannel condenser coil
- Low ambient controls to 0 degrees F
- Single point of power and integral disconnect switch
- Factory-insulated evaporator
- Hail guards
- Chiller heater
- Controls transformer

4.11.2 Central-Station Air-Handling Units

Central-station air-handling units shall be 18-gauge galvanized steel double wall casing. Casing insulation shall be a minimum R-12 rigid insulation. Insulation shall not be exposed to airstream. The casing air leakage rate shall be no more than 1 percent at 8-inches of water gauge pressure.

Hinged access doors shall be provided in every section requiring routine access for maintenance including, mixing plenums with damper actuators, filter section, access sections for coil cleaning, and fan sections. Provide LED lights in all access sections. Access doors shall be thermally broken and gasket around door perimeter.

Provide base rail and concrete pad combination necessary to support correctly sized condensate drain trap. Minimum base rail height shall be 6-inches.

Provide 4-inch thick MERV 8 pre-filters and MERV 13 pleated final filter. Each filter bank shall have a separate differential pressure gauge and separate analog inputs to BAS.

Provide window and lights in fan sections.

Hydronic coils shall be AHRI rated. Provide coils with thickest fin option. Provide coils with manufacturer applied coating to protect against salt air corrosion. Drain pans in chilled water coil section shall be stainless steel and constructed in compliance with ASHRAE Standard 62.1. Maximum face velocity for chilled water coils shall be 500 fpm.

Air-handling unit fans shall be direct drive plenum type, minimum Class II fan construction. Air-handling units greater than 20,000 CFM shall use at least two supply fans. Select fan and motor with pre-filter and main filter both at dirty filter conditions.

4.11.3 Heating Water Boilers

Boilers shall be certified and listed in accordance with AHRI.

UL Compliance: Boilers must be tested for compliance with UL 834, “Standard for Heating, Water Supply, and Power Boilers-Electric” Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

ASME Compliance: Condensing boilers must be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section IV “Heating Boilers”.

Minimum of two boilers each sized at minimum 75 percent of design peak plant demand.

Stage boilers to provide maximum plant efficiency while maintaining minimum recommended flow rates through operating boilers.

Provide boilers to support variable-primary flow system configuration. Provide heating water boilers that do not require constant volume circulators.

Pipe boilers in reverse-return configuration at the boiler plant. Provide balancing valves on the low-pressure side of each boiler. Provide motor-operated isolation valves at each boiler to automatically shut-down flow through non-firing boiler.

Provide control interface to the BAS system.

4.11.4 Circulating Pumps

- Use split-coupled vertical in-line pumps
- Provide at least one pump to meet design flow condition and at least one back-up pump for all system types. Program pumps to alternate between operating duty and backup duty to equalize runtime.

4.11.5 Water-Source Heat Pumps (WSHP)

Water-Source Heat Pump systems may use either tower/boiler water loop.

WSHP units 6-tons and smaller shall be use two-stage compressors and have an electronically commutated supply fan motor capable of automatically changing fan speed in

response to space temperature demand. Size WSHP zones to maintain unit sizes no greater than 6 tons.

4.11.6 Chilled Beams

Chilled beam systems shall include temperature sensors and control algorithms to prevent condensation.

4.11.7 HVAC Controls

All HVAC equipment shall be fully integrated into a Building Automation System (BAS). All control set points shall be able to be viewed and remotely changed from the BAS operator workstation. Control and monitoring points available through equipment manufacturer's controller (including, but not limited to chillers, boilers, packaged DX-equipment, computer room units, etc.) shall be fully integrated with the DDC control system. This shall include all instrumentation and interface points.

All equipment shall operate on the local BAS controller or integrated packaged unit manufacturer's controller. The unit controllers and packaged equipment controllers shall have two way communication with the BAS and allow all control functions, alarms, operating schedules, set points, set point adjustment, optimum start and optimum stop sequences relayed to the BAS using BACnet protocol. The unit controller shall retain programming, schedules, and set points in the event of a power loss. Critical HVAC equipment shall have its control system on backup battery and emergency generator. A diesel-fueled engine generator set shall provide power for the emergency/standby system loads.

Provide control products including controllers, sensors, actuators, control dampers and devices required to make a complete and functional control system. Provide air measuring stations for outside air intake.

Provide items for operating and controlling heating, cooling, ventilating, systems and equipment for energy management and conservation. Include piping, wiring, conduit, control panels, thermostats, timers, and recording and alarm devices. Interlock controls with site BAS. System and components must be BACnet compliant.

4.11.8 Energy Metering

All energy meters shall report both consumption and demand for each system and sub-system listed. Energy data shall be fully integrated into the BAS. The BAS controls contractor shall be responsible for ensuring all connections from the energy meters to the BAS system are made and are fully functional. Provide separate electrical meters for:

Process power loads such as lighting must be metered and monitored by BAS separate from normal building consumption to have a comparable baseline between actual energy consumption and modeled energy.

Provide and monitor heating water system Btu meter for each unique boiler plant. Provide and monitor chilled water system Btu meter if applicable. Water flow meters shall be in-line electromagnetic type.

Provide and monitor domestic water meter(s).

The power monitoring system shall monitor points in power distribution system and be able to provide local and remote readings. The power monitoring system shall, through software on a personal computer workstation and be able to monitor multiple devices at one time. The electronic meters shall provide metering values such as frequency, current, voltage, power factor, power, demand current and real power, and accumulated real and reactive energy. Meters shall retain historical circuit data, time and date, setup and configuration values, and diagnostics data in the event of a control power failure, without the need for an internal battery. Meters shall be installed in all switchboards, switchgear, emergency power distribution devices and selected panelboards to obtain a clear understanding of the power consumption within the facility. Meter locations shall allow the user to monitor, track and produce reports of the energy usage of the Operations, Operator, SFMTA and any other tenant within the facility. The metering software shall be able to be installed on multiple devices, personal computers, as required.

The monitoring system shall provide the needed information for the PNC to develop and maintain an energy model and energy management plan.

4.11.9 Systems Testing and Balancing

Piping and Air Systems Testing, Adjusting and Balancing: Testing, adjusting and balancing agent must be AABC, NEBB or TABB certified. Makeup air units, exhaust fans, and air distribution system to be balanced in accordance with certifying agency standards. All system controls operation to be verified. Assist the Commissioning Provider as needed.

4.11.10 Building Automated System

The Building Automated System (BAS) shall be non-proprietary open protocol, BAC-net capable, and designed to be fully interoperable the existing SFMTA network of BMS systems presently functioning in other buildings. The PPC will coordinate with the SFMTA with respect to the SFMTA's established BAS

system architecture, as well as standards and procedures in how to automate, record and track building systems and their performance over time. This shall include the ability for the SFMTA to monitor and manage the Facility's BAS system remotely using any PC that is connected to the SFMTA BAS internal network. The BMS shall be developed in coordination with the Project's Building Information Model (BIM).

4.12 Fire Protection

General:

The Bus Yard Component and Common Infrastructure shall be fully protected with automatic fire suppression systems including wet and dry pipe automatic sprinklers, in-rack or ESFR sprinklers in high rack storage area, and fire department standpipe hose valve stations, and clean agent gas fire suppression systems.

A minimum of two fire department connections (FDC) shall be provided for the Facility on separate streets in locations approved by the San Francisco Fire Department (SFFD), each FDC shall be located within 100 feet of a fire hydrant. Provide FDC signage as required by the SFFD.

Provide a complete sprinkler system design, including sprinklers, branch lines, floor mains and risers, shown on the drawings. The sprinkler system plans shall include node and pipe identification used in the hydraulic calculations. Shop drawings, seismic and hydraulic calculations shall be provided as specified in NFPA 13 and 14. Fire suppression system permit plans and hydraulic calculations shall be sealed by an appropriately licensed fire protection contractor.

4.12.1 Fire Pump

Conduct a fire water flow test prior to design. If the fire flow test demonstrates insufficient water supply to satisfy the expected fire suppression demands coordinate with the City necessary infrastructure upgrades.A fire booster pump system shall be provided to supply fire water to the Project.

- A jockey pump shall be provided to maintain the system pressure.
- Fire pump shall be provided with both a test header and a closed test loop with flow meter.
- Fire pump shall be provided with an automatic transfer switch to transfer power from the building emergency generator. A diesel-fueled engine generator set shall provide power for the emergency/standby system loads.

Sprinklers:

- Office Areas, Toilet Rooms, Locker Rooms, Lounges, Conference Rooms and similar type areas sha be designed based on Light Hazard Occupancy. The minimum design density shall be 0.10 GPM/sf over the hydraulically most remote 1500 sf with a maximum sprinkler spacing of 225 sf. Hose stream allowance shall be 100 GPM.
- Office Storage Rooms, Custodial Rooms, Mechanical and Electrical Rooms and similar type areas shall be designed based on Ordinary Hazard Group 1 Occupancy. The minimum design density shall be 0.15 GPM/sf over the hydraulically most remote 1500 sf with a maximum sprinkler spacing of 130 sf. Hose stream allowance shall be 250 GPM.
- Shops and Service Areas (Non-Vehicle Maintenance) and similar type areas shall be designed based on Ordinary Hazard Group 1 Occupancy. The minimum design density shall be 0.15 GPM/sf over the hydraulically most remote 1500 sf with a maximum sprinkler spacing of 130 sf. Hose stream allowance shall be 250 GPM.
- Vehicle Maintenance Shops and Service Areas and similar type areas shall be designed based on Ordinary Hazard Group 2 Occupancy. The minimum design density shall be 0.20 GPM/sf over the hydraulically most remote 1500 sf with a maximum sprinkler spacing of 130 sf. Hose stream allowance shall be 250 GPM. The fire system in the main shop shall be designed to shut down the high voltage traction power instantaneously when the sprinkler or standpipe system is activated.
- Loading docks and building canopies with storage or vehicles parked beneath shall be provided with dry pipe automatic sprinkler systems with design based on Ordinary Hazard Group 2 Occupancy. The minimum design density shall be 0.20 GPM/sf over the hydraulically most remote 1950 sf or largest room, whichever is less, with a maximum sprinkler spacing of 130 sf. Hose stream allowance shall be 250 GPM.
- Storage areas with storage 12-feet or less high shall be based on protection of Class IV encapsulated commodities stored on racks up to 12-feet high. Automatic sprinkler design shall be based Miscellaneous Storage, Extra Hazard Group 1, with minimum design density shall be 0.30 GPM/sf over the hydraulically most remote 2500 sf with a maximum sprinkler spacing of 100 sf.
- Storage areas with high rack storage above 12-feet high shall be based on protection of Class IV encapsulated commodities. High

hazard commodities, such as rubber tires, Group A plastics, flammable liquids, idle pallets and similar commodities shall not exceed a height of 5-feet, stored on racks spaced 8-feet or greater apart, with storage up to a maximum height of 20-feet high. Automatic sprinkler design shall be based on in-rack sprinklers accordance with NFPA 13 with a maximum sprinkler spacing of 100 sf for ceiling sprinklers. Comply with NFPA 13 for ESFR coverage if used.

- In addition to the sprinkler systems, Maintenance, Inspection, Service and High Rack Storage (over 12-feet high) Areas shall be provided with a 2-1/2-inch fire department valve stations including a 2-1/2-inch angle valve with a capped outlet for fire department hose connection.
- For dry automatic sprinkler systems, the hydraulically most remote area shall be increased 30 percent.
- Dispatch and IT Server Rooms shall be provided with clean agent fire extinguishing gas system.
- Heads shall be centered in ceiling tiles where acoustical ceiling tile is present. Two-piece adjustable escutcheons and extended coverage heads are prohibited.

Clean Agent Fire Suppression:

- Clean agent fire suppression systems shall be provided in Communication Rooms, Data Rooms and Computer Rooms where critical or high cost computer/network equipment is present. Clean agent suppression system shall be either fluorinated ketone (PFC) type clean agent or an inert gas system.
- Provide back-up wet automatic sprinkler systems in rooms with clean agent unless required by AHJ. If wet system is required, system shall be a preaction type dry system.

Standpipes:

- A Class 1 Standpipe system shall be provided throughout the Facility for Fire department access. Provide 2-1/2-inch fire department valves in accordance with NFPA 14.
- Initial coordination with San Francisco Fire Department indicated their preference for standpipes to be provided to the roof. Walkways and ladders will be requested to provide access to locations inaccessible to ladder trucks due to the presence of track, OCS wiring, or adjacent buildings.
- Automatic shutdown of OCS power systems shall be provided in response to fire detection or activation of fire suppression system.

Fire Suppression Piping:

- Fire water service from the existing site fire water main shall be routed below grade to provide service to each building. Underground fire service from inside 5-feet of the building to inside shall be ductile iron or stainless steel. Underground service shall be wrapped in accordance with AWWA C105.
- Schedule 40 black steel pipe with threaded ends, ductile or malleable iron fittings for piping 2-inch and smaller. Schedule 40 black steel pipe with roll-grooved ends and uncoated fittings for piping 2-1/2-inch and larger. Dry pipe sprinkler system piping shall be Schedule 40, galvanized steel.

Fire Alarm and Supervisory Systems:

- Automatic sprinkler water flow alarm(s) shall be provided and connected to the fire alarm system and transmit a water flow alarm to the Fire Department and building fire alarm. Sprinkler valve tamper switches shall transmit a trouble alarm to the Fire Department and provide a local audible signal. Sprinkler systems shall have inspector's tests stations. Coordinate monitoring of tamper and flow switches with fire alarm contractor.

4.12.3 Fire Protection Specialties

Provide firefighting devices and storage cabinets, not including items or devices physically connected to a fire protection system. Include the following:

- Fire Extinguishers (FE) on brackets attached to wall.
- Fire Extinguisher Cabinets (FEC).
- Signage and Pavement Markings.
- Fire Department Key Box. As required by SFFD.

4.13 Electrical

General:

- The PPC shall design, permit and construct all power, lighting, control, communications, fire alarm, and security systems as described in all Sections of this Design Criteria. All work shall be in accordance with the listed Criteria. The Electrical Scope of Work shall include, but not be limited to:
  - ✓ Site investigation to examine existing conditions
  - ✓ Coordination with PG&E, the SFMTA representatives, building department, and other AHJ.
  - ✓ Preparation of Construction Documents including drawings, calculations, analyses, protective device coordination, specifications, shop drawings and other

necessary documents to fully describe the electrical work and to prove compliance with the listed criteria.

- ✓ Design and construction of Electrical components in accordance with listed seismic design requirements.
- ✓ Preparation of forms and exhibits as required to show compliance with prescribed energy and sustainability codes, standards and guidelines.
- ✓ Completion of necessary forms and documentation for electrical permits and energy code compliance as it pertains to the electrical work.
- ✓ Work with the SFMTA IT Department to define the power for systems components. Define requirements for power and communication conduit to meet systems requirements.
- ✓ Coordinate all electrical design work with the mechanical designer(s) and Facility design engineers to ensure all items requiring electricity are connected as well as environmental conditions for equipment such as the UPS batteries are met.
- ✓ Coordinate between the elevator contractor and the electrical contractor work to meet all applicable local/state codes. This shall be delineated in the specifications and the design.
- ✓ Identify general location of equipment to define chases, duct-banks and support requirements to be included in building and structure. Provide information to architects and ensure that space is provided.
- ✓ Testing, coordination, observation, commissioning and reporting.
- ✓ Design and construction of BEB infrastructure, per Division 5 (*Battery-Electric Bus Supplemental Criteria)* of the Technical Requirements.
- ✓ Design and construction of electrical infrastructure and fit-out of electric non-revenue vehicle charging.
- ✓ Coordination, disconnection, and reconnection of OCS Traction Power system to support trolley bus charging.

Calculations and Analyses:

- Submit the following calculations and analyses, sealed by a Registered Professional Engineer:
  - ✓ Demand load as calculated per requirements of NFPA 70 Article 220.
  - ✓ Lighting Photometrics: Submit point-by-point calculations for 100 percent of the site and each unique room type in the buildings. Submit separate calculations proving compliance with NFPA 101 for emergency/egress lighting.
  - ✓ Emergency generator – provide calculations proving the capability of the proposed generator to serve the required emergency loads plus 25 percent spare capacity. The analysis shall assume the spare capacity load to be constant kVA load. Analysis shall include starting of motor loads as sequenced by the BAS. Calculations shall assume generator operation with diesel fuel source. A diesel-fueled engine generator set shall provide power for the emergency/standby system loads.
  - ✓ Short circuit – provide calculated momentary (0.5 cycle) fault current values for all 15 kV and 480V busses, and 208/240V panels served from 75 kVA or larger transformers.
  - ✓ Arc flash (hazard analysis, arc flash boundary, incident energy) – provide calculation results for all busses 150V (AC and DC) and greater.
  - ✓ Voltage drop – provide calculations for the main building services, feeders longer than 50-feet, all site lighting branch circuits, and all branch circuits longer than 75-feet or loaded greater than 50 percent of the circuit rating.
  - ✓ Protective device coordination – provide time-current curve (TCC) plots showing proper coordination of all panel main breakers with upline devices, coordination of switchboard feeder breakers with main breakers and coordination of switchboard main breakers with 15 kV feeder relaying.
  - ✓ Fire Alarm – provide battery capacity calculations proving compliance with NFPA 72.
  - ✓ UPS – provide battery capacity calculations.

Building Electrical Service:

- 480Y/277V shall be provided for the facility from the utility-owned transformer and electrical service. The service shall be sized using Appendix C as a guide, with final calculations provided and verified by the PPC. The building service shall be rated to carry 150 percent of the building demand load at 104 degrees F maximum, and 86 degrees F average daily temperature. The PPC shall accommodate any required electrical equipment for the building service in accordance with PG&E and SFPUC requirements.

- Low voltage service from the PG&E service equipment to the building switchgear shall be routed in a concrete encased duct bank. Two spare conduits shall be provided.

4.13.1 Building Power Distribution

- The building power distribution shall be organized substantially as presented in Appendix C, or as required by the SFPUC or PG&E in response to the Applications for Electrical Service initiated by the SFMTA. The main switchboard shall be rated for 150 percent of the building demand as calculated per NFPA 70 Article 220, 480Y/277V and provided with the following:
  - ✓ Copper phase bussing with a solidly grounded copper neutral bus and copper ground bus.
  - ✓ A main circuit breaker with intelligent solid-state LSIG trip units with data communications.
  - ✓ Fully rated feeder circuit breakers with solid-state intelligent LSIG trip units with data communications to serve the essential loads.
  - ✓ Fully rated feeder breakers with solid-state intelligent LSIG trip units for the shop and building distribution panelboards.
  - ✓ A digital power metering system capable of providing data to the BAS.
  - ✓ A Surge Protective Device integral to the switchboard, sized to protect all facility elements served through the switchboard.
  - ✓ Backup power for switch gear control circuit.
  - ✓ Transformers supplying non-linear loads will be K-rated.
- Building distribution shall be provided via a system of 480Y/277V circuit breaker distribution panelboards and a combination of 480Y/277V and 208Y/120V smaller branch panelboards. Electrical panels shall have copper buses with bolt-in circuit breakers. Plug-in circuit breakers will be allowed for circuit breaker sizes over 100 amperes where a positive locking device is available to retain the circuit breaker in place. Panelboards shall be provided with a main circuit breaker and shall be fully rated for anticipated fault current levels. Panelboards serving non-linear loads shall be furnished with a 200 percent rated neutral bus. Series rated circuit breakers shall not be used. All branch circuit and lighting panelboards shall be fully populated with circuit breakers. 20 percent of the circuit breakers in each panel shall be spares. Distribution panelboards shall have spare spaces amounting to 20 percent of the total breaker space. Conductors for all power circuits shall be THHN/THWN insulation.
- Sub-Metering: Building loads shall be sub-metered for energy consumption. Metering and data collection shall be provided as required for LEED EA Credit “Advanced Energy Metering”. Load sub-categories shall also be metered.

Interior Lighting:

- All interior and exterior lighting shall employ fixtures with LED light sources. Interior lighting will generally be served at 277V in order to reduce circuit losses.
- Lighting in administrative areas shall typically be provided from LED direct/indirect grid troffers and recessed downlights. All spaces having a lay-in grid ceiling shall employ recessed fixtures, except spaces with ceiling heights of 9-feet or greater may be provided with pendant/stem mounted linear direct/indirect architectural fixtures.
- Exit signs shall be internally illuminated LED type. The emergency lighting at the exterior egress doors shall be provided to illuminate the path of egress outside of the exit.
- Lighting in the maintenance, shop and warehouse areas shall be LED high-bay fixtures. Maintenance pit lighting shall be enclosed and gasketed 4-foot strip LED fixtures with IP66 rating. Fixtures shall be mounted on or adjacent to the track support structures, with provisions to allow the individual fixtures to be rotated by hand to any angle from +90 degrees to -90 degrees relative to horizontal.
- Individual offices, group offices and conference room lighting shall be controlled with dual-technology occupancy sensors and daylight dimming controls. Lighting in conference rooms and training rooms shall be designed to an average level of 30 foot-candles, and shall be dimmable to 5 percent of maximum output.
- Spaces without occupancy-based controls shall be provided with lighting controls that operate on a scheduled time-of-day basis with one or more override switches to selectively extend lighting past the scheduled shut-off time. All controls shall conform to ASHRAE 90.1 guidelines.

Engine Generator:

- A diesel-fueled engine generator set shall provide power for the emergency/standby system loads. The presence of life safety loads requires the generator to be diesel

powered. Generator set capacity shall be 125 percent of the calculated demand of the designated emergency loads. Provide a storage tank with a capacity to store 24 hours of fuel at a generator output of 100 percent of nameplate rating. See Section 4.8.1 for the resilience and recovery requirements for the facility. Provide the following accessories and options:

- ✓ IBC seismic certification.
- ✓ Corrosion-resistant sound attenuating enclosure.
- ✓ Lead-acid starting battery.
- ✓ Remote control/annunciator panel having all capabilities of the local control panel. The remote panel shall be located interior to the East in a normally-occupied space.
- ✓ Control panel shall have network communications capability.
- ✓ Engine block heater, jacket type heater for starting battery.
- ✓ Alarms for low LP fuel tank level.
- ✓ Alarm for low battery voltage.
- ✓ Alarm for battery charger failure.

The code-required emergency power for the lights will be provided from the generator. In addition to the emergency lighting load and other life safety loads, it is anticipated that the generator may be designed to carry additional loads within the facility. IT/communications systems, some HVAC loads, some bus charging loads, and some industrial equipment loads may be connected to the generator. The exact composition of the emergency loading will be coordinated with the SFMTA during the design phase. This loading will drive the generator sizing to handle the load and methods of facility operation in accordance with the SFMTA requirements. Some luminaries may be connected to the generator to provide operational lighting in the event of a power outage.

Items that must be on emergency power:

Life Safety Loads:

- Pathway egress lighting
- Exit lighting
- Fire alarm systems
- Other loads to ensure human life safety

Critical Electrical Loads:

- IT/Data rooms and systems
- Security systems
- Communications systems
- HVAC equipment serving these spaces
- HVAC control system
- Elevator(s)
- Fume ventilation systems

Additional Emergency Loads:

- Automatic garage door openers at entrances and exits of building.

Optional Emergency Loads:

- Compressor(s) and dryer(s).
- Lube pumps - the SFMTA with the assistance of the design team to specify during the PDA design phase.
- Four maintenance bays - SFMTA will the assistance of the design team to specify during the PDA design phase.
- Section 4, Sitework, describes the SFMTA coordination underway with PSE to provide separate power feeders to the East site and the E335 TPSS.

Automatic Transfer Switches/Load Bank:

- Multiple automatic transfer switches (ATS) shall be provided to transfer loads between the normal power system and the emergency power system. Loads shall be assigned to the ATS in accordance with NEC Article 700. Provide a load bank to allow exercising the generator under load without interruption of the building emergency loads. The load bank shall be sized at 100 percent of the maximum generator rating and shall have a step load capability in increments of 25 percent, 50 percent, 75 percent and 100 percent of the load bank rating. A diesel-fueled engine generator set shall provide power for the emergency/standby system loads.

UPS System:

- Loads which cannot tolerate more than a ¼ cycle interruption shall be provided with internal or dedicated battery backup and/or connected to a central UPS or inverter system. These loads include, but are not limited to:
  - ✓ Fire alarm systems (battery).
  - ✓ CCTV systems (UPS).
  - ✓ Telecommunications equipment (UPS).
  - ✓ Emergency Telephone System (ETEL) (UPS).
  - ✓ AC/DC switchgear controls (battery).
  - ✓ BAS PLC (UPS).
  - ✓ Access control (UPS).
- The building UPS systems shall be sized to serve the anticipated demand load plus spare capacity of 25 percent. The UPS batteries shall be sized to carry the maximum UPS rated load for a period of 90 minutes. The PPC shall submit calculations which support the required size of the UPS and batteries. The UPS input shall be fed from the generator or the secondary utility feed for continued operation following the rated load period of

90 minutes. A diesel-fueled engine generator set shall provide power for the emergency/ standby system loads.

Service & Distribution:

- Dry-type distribution transformers shall be utilized to provide the 208Y/120V service to the branch panelboards serving the convenience receptacle and small motor loads. All dry-type distribution transformers shall be energy efficient type having the Energy Star rating. Dry-type transformers shall be VPI insulated. Indoor dry-type transformers shall have copper windings, 220 degrees C insulation and shall have a maximum winding temperature rise of 115 degrees C above an ambient temperature of 40 degrees C. Where transformers serve a significant amount of non-linear loads, the transformers shall have a "K" rating to handle the additional heating caused by high-harmonic load content. The neutral of secondary feeders from K-rated transformers shall be sized at 200 percent of the ampacity of the phase conductors.

Disconnecting Means:

- Receptacles for all small equipment loads may serve as the disconnecting means. 480V and 208V loads shall be provided with a disconnect (safety) switch with means to padlock disconnect in the off position. All safety switches shall be heavy-duty type. Transformers not located within eyesight of their source panel shall be provided with a disconnect (safety) switch on the primary side of the transformer.
- Motor loads ½ horsepower and larger shall be served at 480V 3 phase. Small fractional horsepower motors shall be served at 120V 1 phase. Shop equipment loads shall be served at 480V 3 phase, 208V 3 phase, 208V 1 phase, or 120V 1 phase as per their requirements. Convenience receptacles shall be served at 120V 1 phase.
- Welding equipment shall be supplied from dedicated panelboards.

Grounding:

- A quality single-point grounding system shall be provided in the main electrical room consisting of a main grounding bus bar (MGB) connected to a building counterpoise. The building steel frame, water service entrance pipe (if metallic piping is used, electrical equipment ground conductors, isolated ground conductors, and telecommunications and data system ground shall be connected to the MGB. The Main Telecommunication Room (MTR) and each telecommunications room or telecommunications closet (TR/ TC) shall be provided with a copper telecommunications ground bar (TGB). The Main Telecommunication Ground Bar (MTGB) shall be located in the MTR. A #3/0 AWG Telecommunication Bonding Backbone (TBB) shall connect the MTGB, the TGBs and the MGB. Grounding for communication circuits shall be in accordance with TIA/EIA J-STD 607 and Motorola R56 standards.
- All metal raceways shall include an equipment grounding conductor sized in accordance with NFPA 70.

Lightning Protection:

- PPC shall perform a risk assessment calculation as shown in NFPA 780, Annex L to assess the lightning risk to the facility. If the risk assessment recommends protection, provide a UL Master Label lightning protection system in accordance with NFPA 780. Building lightning protection consisting of air terminals and down conductors shall be provided. The building counterpoise shall serve as the grounding electrode. Incoming copper telecommunications wiring shall be provided with individual gas-filled surge arrestors sacrificial pigtail connector to protect communications equipment and wiring for transient surges caused by lightning or other outside disturbances.

4.13.2 Electrical System Sustainability

The Project shall comply with all energy and electrical efficiency requirements in the San Francisco Municipal Green Building Code (Environment Code Chapter 7), which shall supersede the narrative provided in this DCD.

Energy and Emissions:

- The emergency generator shall be specified to meet EPA emission requirements for gaseous fueled engines.
- A diesel-fueled engine generator set shall provide power for the emergency/standby system loads.

Energy Efficiency:

- Lighting shall be designed to minimize the electricity consumption required and will meet or exceed the requirements of ASHRAE 90.1 and state and local energy codes.
- Electrical motors shall be the premium efficiency type.
- Transformers shall meet or exceed NEMA minimum efficiency ratings.
- Lighting controls shall be employed to reduce energy consumption. Vacancy sensors shall be provided in offices, conference room and

other similar areas. Occupancy sensors shall be provided in janitor's closets, bathroom, locker rooms and other similarly occupied spaces. Time of day lighting controls shall be provided to turn lighting off throughout the building at specific times specified by the building or department user. A two hour over ride switch shall be provided to allow the lighting to remain on if someone is working additional hours. Lighting shall be able to be switched to 50 percent level when building cleaning staff is on site so that building lights to not have to be fully energized for this task. If daylighting can be employed, daylighting sensors may be used to reduce the lighting in areas where there is sufficient daylight to perform the required tasks.

Alternative Energy Sources:

- Solar Power:
  - ✓ PPC shall integrate a photovoltaic (PV) power system installation, consistent with the Municipal Green Building Code.
  - ✓ The PV system installation shall conform to NFPA 70 Article 690 and requirements of PG&E.
  - ✓ PV system shall supply power to the BYC. PV connection to the CIC is also acceptable.
- Battery Storage:
  - ✓ PPC is encouraged to include on-site battery storage to maximum on-site power generation and storage potential to provide emergency backup power for the BYC or the future BEB fleet specifically.

Commercial Equipment:

- PPC shall coordinate with third party commercial suppliers of vending machines, wash soap, fluids utilized in maintenance shops, sand, parts suppliers and any other commercial supplier as indicated by the SFMTA to determine space and access requirements and incorporate this information into the facility layout.

4.13.3 General Arrangement and Infrastructure Requirements

- Special attention shall be made to ensure that equipment provided meets the requirements of the SFMTA prescriptive specifications and is fully compatible in form, fit and function with existing equipment as defined. Conduit in interior shop areas, external locations, the storage building or any locations subject to potential damage shall be rigid conduit. Conduit in interior office areas shall be EMT conduit.

4.13.4 Telecommunication Rooms and Closets

- The Telecommunication Room for each floor shall be environmentally controlled with HVAC equipment, lighted and fire protected. The Telecommunication Room shall be provided with keycard access and intrusion detection.
- Main Communication Room shall have all HVAC equipment requirements needed to keep the room and systems cool.
- In addition to the Telecommunication Rooms, the PPC shall provide IT closets as required to ensure that raceway runs from data outlet or Ethernet connected equipment to the Telecommunication room or the nearest IT closet is not more than 275-feet.
- IT closets, if provided, shall have louvered doors to facilitate heat transfer from the room. Powered and temperature controlled exhaust fans are required for each IT closet if the IT closet electronics consumes over 80 watts of power.
- Lighting shall be configured parallel and in the front and back of all PPC and the SFMTA required racks.
- Space and lighting requirements, including clearance in front and back of racks, in the Telecommunication rooms and closets shall conform to the latest version at time of notice to proceed of the Building Industry Consultants Service Industry Transmission Distribution Methods Manual (BICSI TDMM).
- An AC sub-panel with a separate 20A 120V breakers for each equipment rack (five (5) racks per room) shall be provided for the IT room. This sub-panel shall be supplied by the standby power circuit. Four (4) wall mounted 20A 120V convenience receptacles shall be provided in the Telecommunication room and one in each IT closet.
- Cable trays shall be provided along the perimeter of the Telecommunication room and over the planned location of the five (5) racks to support all required cabling systems. Cable trays shall be sized for maximum 40 percent fill; minimum width shall be 9-inches.
- Where ceilings are provided, control conduits and wiring will be run as high above the ceiling as possible to allow easy removal of ceiling tiles without interference due to control or communication subsystems.
- Cable runs above ceilings which are not in cable trays shall be supported by J-hooks specifically manufactured for supporting cable systems.
- For basis of design, the cooling provision of 20 tons shall be used. Actual heat loads and

cooling equipment sizing shall be determined during final design.

- Telecommunications Rooms shall house the incoming telecom service conductors, the PPC shall provide or install IT/ Communications conductors or fiber optic cables, the E750 PPC shall provide and install fiber optic cables, and owner provided telecommunications switch, horizontal cross connects and equipment racks.

4.13.5 Phone Jacks and Cabling

- Phone Jacks and Cabling are limited to the communications methods of the FACP to the remote Supervising Station and to the telephone and monitoring of the elevator(s).

4.13.6 Network Ethernet Switches

- The PPC shall coordinate with the SFMTA IT prior to design of the Data Room and TR/TCs for the space, power, cooling, bonding and other requirements of the SFMTA IT Network Ethernet Switches and other equipment.
- The SFMTA will install Network Ethernet Switches and other equipment in the Data Room and TR/TCs referenced in this chapter during the warranty period. The PPC shall not invalidate the warranty based on the SFMTA Network Ethernet Switches and other equipment installation.

4.13.7 IT Servers

- The PPC shall coordinate with the SFMTA IT prior to design of the Data Room and TR/TCs for the space, power, cooling, bonding and other requirements of the SFMTA IT servers and other equipment.
- The SFMTA will install IT Servers and other equipment in the Data Room and TR/TCs referenced in this chapter during the warranty period. The PPC shall not invalidate the warranty based on the SFMTA IT Servers and other equipment installation.

4.13.8 IT Equipment Procurement

- Customized IT systems such as Radio, Computer Aired Dispatching, Access Control, Cameras, Fleet Watch (including antenna location to capture bus information), and others shall be addressed in detailed design and equipment procurement in coordination with the SFMTA. The SFMTA expects that available IT infrastructure may evolve by the time construction is completed and therefore will do a final review of the IT equipment and supporting infrastructure prior to their ordering and installation.

4.13.9 Closed Circuit Television System (CCTV)

- The PPC will work with SFMTA Security staff to ensure all camera locations are correct and that camera views meet their needs. The PPC shall design the quantity and location of cameras for the CCTV system using APTA IT-CCTV-RP-001-11," APTA Recommended Practice for the Selection of Cameras, Digital Recording Systems, Digital High-Speed Networks and Trainlines for Use in Transit-Related CCTV Systems".
- Camera views will be selected based on their function, location and resolution. The PPC shall submit the CCTV design site plan that shows camera locations, coverage, camera function and the camera model for each location. Submittal shall also include required views generated from the project 3D model from each camera location. The camera design layout shall be approved by SFMTA Security staff prior to implementation. Once the design is approved, no changes shall be made without SFMTA Security staff's acceptance.
- The CCTV system shall be compatible with and integrated into the SFMTA's existing Genetec CCTV system. The PPC's price shall allow for one version upgrade of the cameras beyond software version at time of installation. The PPC shall coordinate with SFMTA to access and update the CCTV central servers.
- The PPC shall provide all raceway, cabling, cameras, and mounting hardware/poles. Cameras shall be mounted in locations where maintenance staff can access without requiring fall protection.
- The PPC shall provide fixed view (unless otherwise identified) CCTV coverage to the following areas at a minimum:
  - ✓ The complete site perimeter shall be covered with cameras installed no greater than 200-feet apart oriented in an overlapping field of view configuration with resolution sufficient for security personnel to determine what is present by class (animal, blowing debris or person).
  - ✓ Entrances and exits into facility site shall be covered. All vehicle and pedestrian access points shall be covered with two dedicated fixed wide angle cameras with a resolution sufficient to uniquely identify an object on the basis of appearance (John, not Tom). One camera will be focused on the individual attempting to access the facility and the other camera will be focused on vehicle license plates.
  - ✓ All exterior building access points including vehicle, and pedestrian, shall be covered from the outside with a resolution

sufficient to uniquely identify an object on the basis of appearance.
- ✓ The loading dock(s) shall be covered.
- ✓ Parking areas shall each be covered with a minimum of two dedicated fixed cameras with overlapping coverage and shall have resolution sufficient for security personnel to determine what is present by class (animal, blowing debris or person).
- ✓ Note that additional cameras may be required for other systems outside of this CCTV section of the project requirements.
- ✓ Coordinate with the SFMTA security for areas that may require additional cameras due to high probability of intrusions.

- Existing SFMTA camera monitoring stations shall be configured by the PPC.

4.13.10 Fire Alarm System

- The Fire Alarm System shall be furnished and installed in the building conforming to NFPA 72. The system shall be looped, Class A, addressable, intelligent and supervised with a Fire Alarm Control Panel located in the main electrical room. The system shall be programmable, configurable and expandable in the field without the need for special tools, PROM programmers or PC-based programmers. Network communications capability over both a LAN or WAN shall be provided.
- The Supervising Station shall be a third party and shall conform to NFPA 72 as accepted by the AHJ and approved by the SFMTA. Communications Methods between the Supervising Station and the SFMTA in compliance with NFPA 72. The fire alarm control panel shall interface with the BAS system for general fire alarms.
- Photoelectric duct detectors will be provided in Air Handling Units when required by code. In accordance with NFPA 72 and the ADA, combination audible/visual notification devices will be installed throughout the facility to provide notification of an alarm. Visual devices shall be synchronized when more than one device is located in a common field of view. Tamper and flow switches shall be provided for the sprinkler system at the fire risers, valve pits and at the zone valves. Weatherproof exterior speakers shall be provided at exterior gathering locations and entrances to the buildings. An addressable analog fire alarm system with voice alarm shall be provided. A graphical annunciator panel showing the building floor plan depicting the location and status of all fire reporting devices shall be provided at the dedicated entrance to be used by firefighting personnel to respond to emergencies. A remote annunciator for the emergency generator set and elevator shall also be provided.
- A diesel-fueled engine generator set shall provide power for the emergency/standby system loads.
- Pull stations shall be provided at exits and spaced so that there are no more than 100-feet of travel from any point to a pull station.
- Analog smoke detectors which allow the fire alarm system to automatically adjust the detector sensitivity shall be used except where nuisance tripping may occur. In areas where smoke detectors would be unsuitable, such as elevator machine rooms, combination heat and rate-of-rise detectors shall be used. Smoke detectors shall be installed in electrical rooms, telecommunications rooms, elevator lobbies, yard control, under raised computer floors, and other areas of high importance. Smoke detectors shall be provided in the return air ducts of the HVAC equipment to provide for automatic shutdown of these systems when smoke is detected.
- The fire alarm system shall monitor the automatic fire suppression system for water flow, air pressure (if a dry pipe system is installed), and OS&Y valve position. Water flow detection shall initiate a building evacuation alarm. Loss of air pressure and closed valves shall initiate a trouble signal at the main fire alarm panel and at the annunciator.
- The annunciator shall monitor the position of the elevators and indicate if they are operational.
- Control of the building emergency ventilation (if provided) shall be available at the fire alarm panel and at the annunciator.

4.13.11 Communications Server and Workstation Network Interfacing

- Network Interface: Two separate network interface cards (NICs) with 1G bit/sec minimum speed capability each.
- Network Segment Assignment Options:
  - ✓ Define different network segment assignments for each of the NICs.
  - ✓ Define different network segment assignments on the same NIC.

4.13.12 Outdoor Devices

- All electronic devices use in an outdoor environment shall be rated to IP66 level, and withstand operating to three standard deviations of temperature maximum and minimums for this region.

- Rain shields over electronic devices shall be used in most cases of installation for further protection and improved endpoint device function.

4.13.13 Network Management Capabilities

- PPC shall implement all devices to be compatible with Standard Network management health status reporting via SolarWinds Event and Log Monitor software, or otherwise directed by the SFMTA. Devices shall be SNMPv3 compatible.
- PPC shall obtain written direction prior to implementing network connection devices, for instruction herein.

4.14 Wind Study

- Pursuant to the City's wind ordinance (Planning Code Section 148), the Project is required to comply with wind comfort and hazard criteria set forth by the City. Wind analysis has been completed by the SFMTA for the RDC, which is Document 17 (*CEQA Pedestrian Wind Study)* of the Reference Documents. The RDC wind analysis determined that the Project would require design interventions to meet the wind criteria. The Project will be required to complete an updated wind study based on the PPC's proposed massing for the Facility.

4.15 Strategies for Stormwater Handling and Treatment/Pre-Treatment

- Stormwater runoff generated by the Project area must be treated in accordance with the City of San Francisco Stormwater Management Requirements (SMR). The PPC shall create a stormwater management plan meeting the City's SMR that emphasizes use of best management practices (BMPs) on site to mitigate stormwater quality and quantity concerns. Of particular concern, discharge containing oil, sediments, soaps, or other chemicals from the Bus Yard Component shall be captured and means for filtering and treating water prior to discharge shall be incorporated.
- Following the guidance from the City of San Francisco, preference shall be first for rainwater harvesting and reuse, bioretention and infiltration, and permeable pavement to reduce runoff, followed by detention and treatment through lined bioretention or a constructed wetland. The proposed solution shall acknowledge the different sources of runoff on the site and demonstrate an appropriate management plan for each.
- The size of the Project necessitates compliance with San Francisco Article 12C Non-potable Water Ordinance as well. Based on the Project size, a non-potable water system is required on-site to treat and reuse available greywater, rainwater, and foundation drainage for toilet and urinal flushing. The PPC shall propose where such a system shall be housed and identify which uses within the Facility are required to be served by the resulting treated greywater. This necessarily must integrate the stormwater management solutions with on-site treatment and reuse for a comprehensive water management system for the Project.

4.16 Evaluation of Life Cycle Cost Analysis

Decisions impacting resource use, maintenance, and capital cost, such as HVAC system choice, envelope materials and selection, etc., shall be evaluated using a life-cycle cost analysis framework. This approach shall include, at a minimum, the following factors:

- Capital cost
- Energy (electricity, gas, thermal) cost savings
- Water cost savings
- Operations, maintenance, and replacement cost impacts
- Applicable incentives such as tax credits and depreciation benefits
- Space savings

For decisions impacting the Bus Yard Component, the Common Infrastructure, and the Housing and Commercial Component, separate life-cycle cost analysis studies shall be performed indicating the impact to each component individually. Decisions impacting only one of the components may be evaluated in isolation. The period of evaluation shall be assumed to be no less than 30 years and shall be reviewed and confirmed with the City at the outset of the PDA phase. Life-cycle cost analysis evaluation financial parameters shall be determined by the PPC and shall be reviewed and confirmed with the City at the outset of the PDA phase. Financial parameters shall include discount rate, energy cost escalation, water cost escalation, labor and materials escalation, and applicable tax rate (if depreciation is evaluated for a measure) at a minimum. Decisions shall prioritize life-cycle cost benefit as a key driver of selection.

SECTION 5 - REQUIREMENTS FOR BUS YARD COMPONENT SPACE MODULES

This document presents the Requirements for Bus Yard Component Space Modules for the proposed Potrero Yard, by providing both micro and macro level design requirements. The Requirements for Bus Yard Component Space Modules format found in this section consists of Functional Area Modules. The Functional Area Module represents a detailed description of specific design issues for each of the areas listed in Section 2 the Space Needs Program. Reference the Space Needs Program (Section 2.4) for specific data. All Modules and related equipment are for representation purposes only and do not necessarily depict strict design conformance.

5.0 MODULES

Each of the building space modules contains information regarding the function of the space, affinities, critical dimension (if any), equipment, furnishings, and finishes related to this operation. Technical considerations for architectural, structural, mechanical, plumbing, and electrical systems are delineated on the facing page. The space is graphically illustrated. Specific layouts of each area will be developed during detailed design. Note that the equipment and furnishings listed are not intended to be all-inclusive. Spaces are separated into groups based upon function.

Not all spaces listed in the Space Needs Program have a room data sheet including Custodial, Telecommunication Rooms, and Restrooms. This is because these spaces are code- or facility-specific, or are continually changing.

The following module colors are used in the room data sheets that follow as well as the Reference Design Concept plan sheets.

OFFICE MODULES

PARKING

BAYS AND SHOPS

FARE BOX AND CLIPPER CARD READER REPAIR SHOP

SERVICE AND CLEAN

PARTS

MAINTENANCE - ADMINISTRATION

OPERATIONS - ADMINISTRATION

TRANSIT SERVICES

SHARED

TRAINING

5.1 Sustainable Design

There are several sustainable design opportunities that can be implemented at Potrero Yard. The Sustainable Design section outlines potential sustainable design opportunities appropriate for this type of facility. These options are broken into Site Features, Building Design and Materials, Mechanical Systems, Electrical Systems, and Plumbing Systems. The PPC shall also refer to Department of Building Inspection Form GS6: San Francisco Green Building Submittal Form for Municipal Projects for guidance on required measures.

5.2 Utilities Design

The utilities for the maintenance facility are numerous and require close attention to detail. The coordination of the HVAC, electrical, and plumbing systems are critical to the proper function of the Shop and the heart of the facility. Providing an organized installation and design of these systems will enhance future system maintenance.

SECTION 5 - REQUIREMENTS FOR BUS YARD COMPONENT SPACE MODULES

5.3 Creating Sustainable Facilities

Sustainability is an essential and fundamental component of the facility. The key sustainability issues that shall be explored in the planning and development of the facility include, but are not limited to, key points included in this section.

5.3.1 Balance Between Economic and Environmental Needs

To balance both economic and environmental needs, the facility design shall maximize employee health, safety, and operation efficiencies. This priority shall be considered at all stages of development of the facility.

5.3.2 Efficient Use of Resource Materials

Material resources are valuable, and efficient use shall be encouraged in the development and operations of the facility. This can be implemented with reusable, recyclable, and biodegradable materials, as well as mandating the use of products that are extracted, harvested, and manufactured locally.

5.3.3 Efficient Use of Water Resources

The facility plan shall encourage efficient use of water resources through resourceful planning. Examples could include implementing an effective storm water management plan and using environmentally compliant wash bays to service all vehicles. Reclaimed water will be used for irrigation at new City facilities, per the San Francisco Green Building Code Amendments and GS6 Form for municipal projects. Low flow plumbing fixtures and sub-metering are also required.

5.3.4 Energy Efficiency/Renewable Energy Systems

Renewable energy sources like solar, wind, and daylight harvesting shall be utilized, as well as exploring and promoting opportunities to increase energy savings at the facility through the use of high-performance systems.

5.3.5 Construction Methods

Methods of construction of the facility play a significant role in sustaining the environment. Minimizing transportation costs by utilizing local resources and recycling procedures during construction will conserve energy and minimize pollution.

5.3.6 Sustainable Criteria

The following is a list of potential strategies that contribute to sustainable building design:

- Operable windows/natural ventilation
- Occupancy sensors, vacancy sensors, lighting controls
- Lighting designed to meet targeted LEED points (Reference the LEED requirements in Chapter 7 of the City and County of San Francisco Environmental Code)
- Daylighting strategies and daylight harvesting
- User-adjustable comfort and lighting controls
- Underfloor ventilation
- In-floor radiant heating and cooling
- Water reclamation system
- Use of reclaimed water for vehicle washing
- Minimal landscaping along the north and south edges

SECTION 5 - REQUIREMENTS FOR BUS YARD COMPONENT SPACE MODULES

5.4 LEED Certifications

LEED is a green building certification program that recognizes best-in-class building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification. Prerequisites and credits differ for each rating system, and teams choose the best fit for their project.

Each rating system groups requirements that address the unique needs of building and project types on their path towards LEED certification. Once a project team chooses a rating system, they'll use the appropriate credits to guide design and operational decisions.

SFMTA guidelines are to meet LEED Gold Certification, which shall include achieving a minimum of 12 points under LEED credit EAc2 Optimize Energy Performance and 3 points under LEED credit EAc5 Renewable Energy v4.1.

- Platinum 80+ points
- Gold 60 to 79 points
- Silver 50 to 59 points
- Certified 40 to 49 points

5.5 Architectural Systems

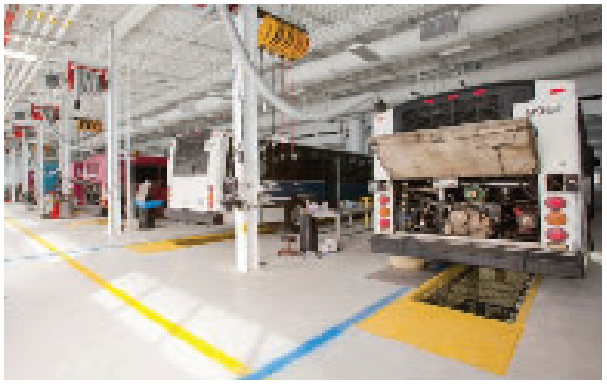
Design and materials that facilitate sustainability include, but are not limited to:

- Use of durable building materials
- Natural light
  - ✓ Skylights
  - ✓ Clerestory
  - ✓ Roof monitors
  - ✓ Windows in bay doors
- Operable windows for natural ventilation
- Low Volatile Organic Compound (VOC) finish materials
- Use of local building products
- Use of recycled materials
- High R-Value roof and wall insulation
- Insulated bay doors
- Low U-value windows and skylights

Translucent clerestory windows daylighting

Insulated translucent sectional door

Solar tube daylighting



Light reflective floor

SECTION 5 - REQUIREMENTS FOR BUS YARD COMPONENT SPACE MODULES

5.6 Mechanical Systems

Mechanical systems that facilitate sustainability include, but are not limited to:

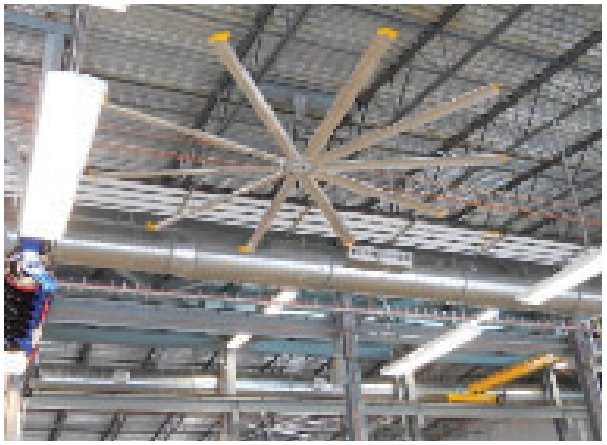
- Radiant floor slab heating
- Variable air volume air handling units
- Variable frequency drive motors
- High efficiency motors for air handling units and DX compressors
- Economizers for free cooling with 100 percent outside air at air handling units
- Demand control ventilation with CO2 and occupancy sensors for reducing ventilation requirements during unoccupied periods

5.7 Additional Cost Alternatives

- Radiant floor slab heating
- Solar Thermal heating for domestic water heater
- High efficiency boiler for hydronic heating loop
- Ground source heat pumps (geothermal)
- Destratification fans

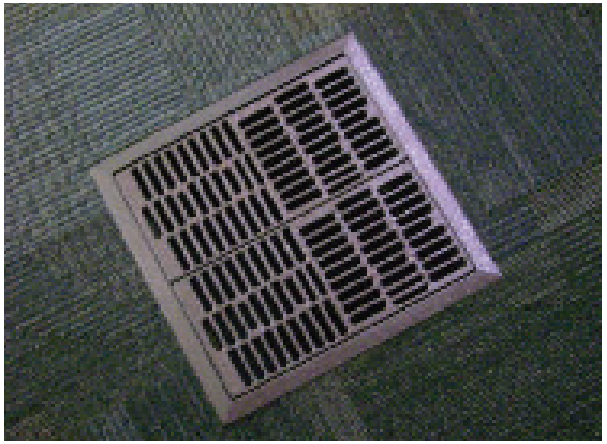
Renewable energy production:

- Photovoltaic
- Wind



Destratification fan

Heat recovery piping



Underfloor air distribution vent

Radiant floor system

SECTION 5 - REQUIREMENTS FOR BUS YARD COMPONENT SPACE MODULES

5.8 Electrical Systems

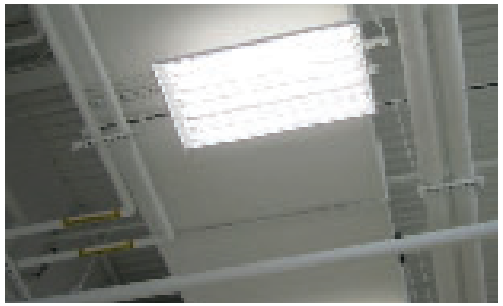
Electrical systems that facilitate sustainability include, but are not limited to:

- Photovoltaic panels to be installed on roof of building
- Maximize lighting controls with daylight harvesting and occupancy and vacancy sensors
- LED lighting systems
- Task lighting in Repair Bays
- Efficient process equipment

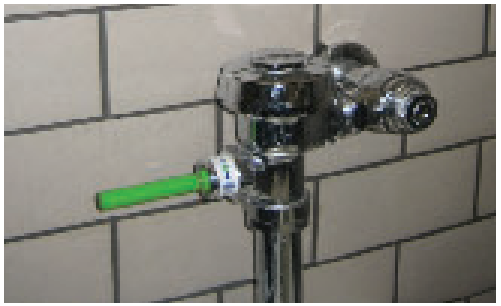
5.9 Plumbing Systems

Plumbing systems that facilitate sustainability include, but are not limited to:

- “We fix” program for new plumbing fixtures
- Rainwater harvesting for irrigation
- Vehicle wash water reclaim
- Low flow plumbing fixtures
- Sensor operated faucets
- Grey water (purple pipe) for water closets
- Tankless water heaters
- Reclaimed water will be used for landscaping at new City facilities, per the San Francisco Green Building Code Amendments and GS6 Form for municipal projects



LED lighting



Dual flush toilet

Wash water reclamation system

Photovoltaic panels on roof

Low-flow plumbing fixtures

Rainwater harvesting

SECTION 5 - REQUIREMENTS FOR BUS YARD COMPONENT SPACE MODULES

5.10 Architectural/Structural Systems Coordination

- Coordinate routing, support systems, and clearances for mechanical ductwork, plumbing piping and electrical conduit
- Routing shall run above forklift and walk aisles
- Group wherever possible
- Route main ventilation ductwork above walk/ forklift aisles
- Use mezzanines for mechanical units

5.10.1 Mechanical Systems Coordination

- Route main ventilation ductwork above walk/ forklift aisles
- Use mezzanines for mechanical units

5.10.2 Plumbing Systems Coordination

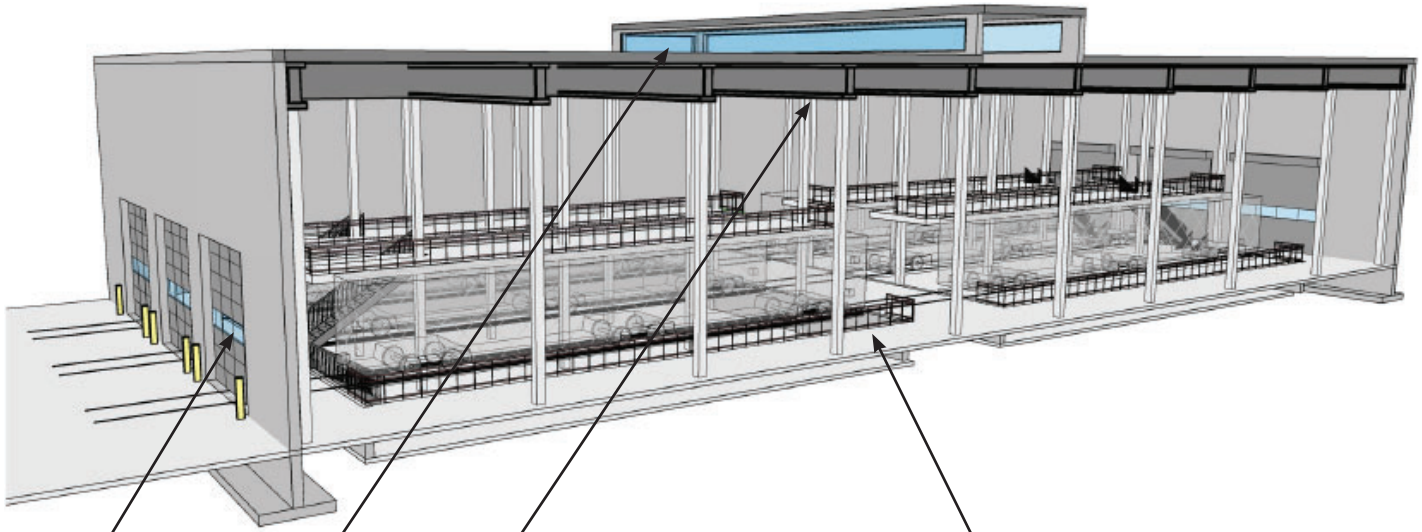
- Route water, sanitary, vent, storm, and service equipment piping above ground and above walk/forklift aisles

5.10.3 Electrical Systems Coordination

- Route main conduit runs above ground and above walk/forklift aisles.
- Communication systems and cable trays shall be coordinated with other building systems to allow for installation, removal of cables in the future. All communications conduits and cable trays shall be routed above ground.
- Route branch circuits, equipment feeds above ground to facilitate future renovations

SECTION 5 - REQUIREMENTS FOR BUS YARD COMPONENT SPACE MODULES

Sustainable Strategies

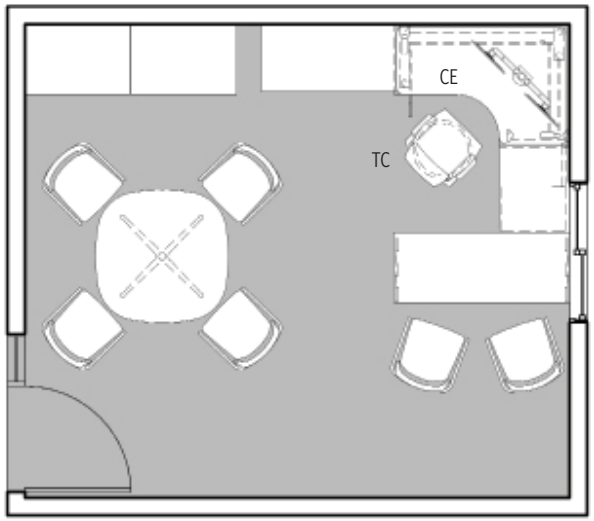


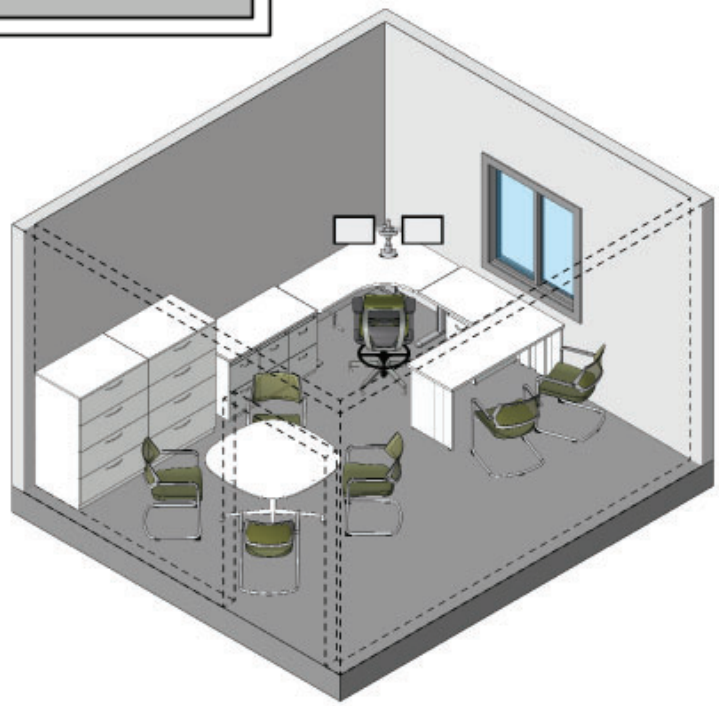
- Daylighting through skylights/clerestories/roof/ monitors/windows in bay doors
- Low VOC finishes
- Operable windows/natural ventilation
- Use of recycled content of materials
- Destratification fans in high bay areas

- Radiant floor slab heating
- Air quality sensors for exhaust fan controls
- Use of durable, long-lasting building materials
- Occupancy sensors
- Use of local building products
- Renewable energy sources such as solar and geothermal

SECTION 5.1: OFFICE MODULES

PRIVATE OFFICE - 224 SF





FUNCTION

Private office for completing work tasks and holding small meetings.

RELATIONSHIP TO OTHER AREAS

- Case specific (office areas specific to each group); reference general modules

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

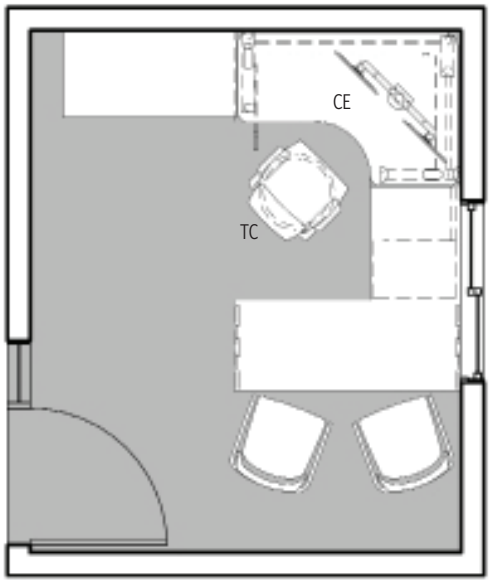
EQUIPMENT/FURNISHINGS

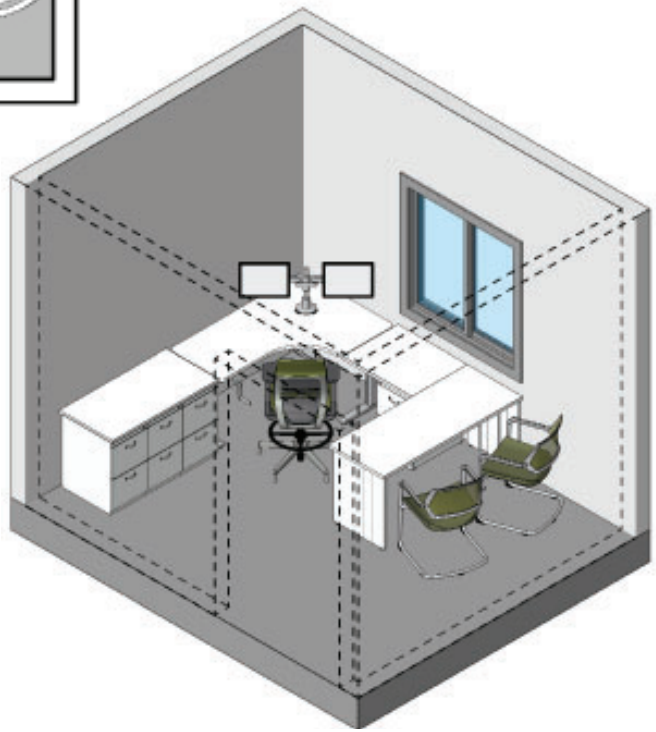
- Task chair
- TMC 60" by 30" typical sit/stand workstation
- Two pedestal cabinets per station. One two-drawers for files, and one three-drawers for personal items and files
- Table and Chairs

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring:
    - Carpet tile floor with rubber base for operation and administration areas. Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
    - Resilient floor covering with base for maintenance areas
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile
  - ✓ Doors:
    - Single leaf 3'-0" door with sidelight and lockable lever set hardware
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ Provide general purpose duplex receptacles (four minimum) and a quad receptacle at each workstation
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in room
- Lighting:
  - ✓ LED Lighting in accordance with IES recommendation (35 fc average)
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (as required)

PRIVATE OFFICE - 120 SF





FUNCTION

Private office for completing work tasks and holding one on one meetings.

RELATIONSHIP TO OTHER AREAS

- Case specific (office areas specific to each group); reference general modules

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

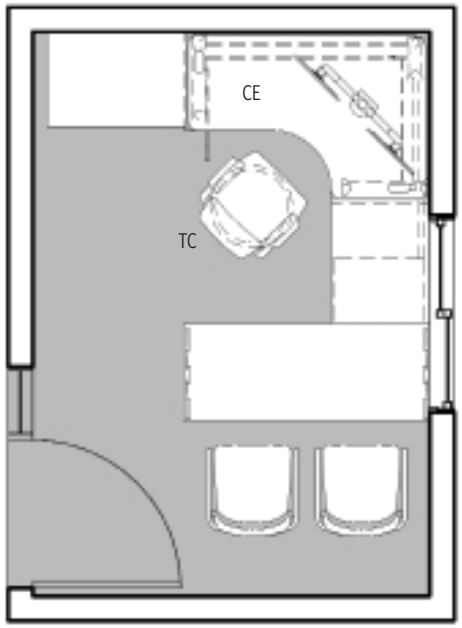
EQUIPMENT/FURNISHINGS

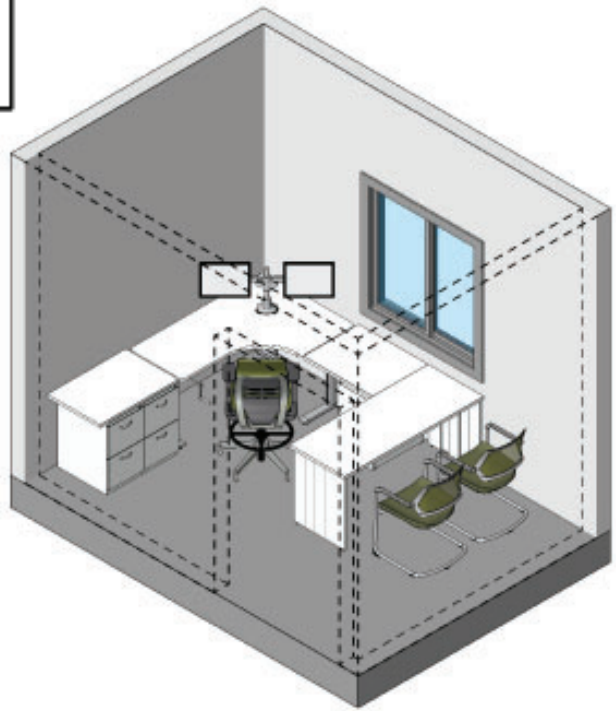
- Task chair
- TMC 60" by 30" typical sit/ stand workstation
- Two pedestal cabinets per station. One two-drawers for files, and one three-drawers for personal items and files
- Guest chairs

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring:
    - Carpet tile floor with rubber base for operation and administration areas. Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
    - Resilient floor covering with base for maintenance areas
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile
  - ✓ Doors:
    - Single leaf 3'-0" door with sidelight and lockable lever set hardware
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ Provide general purpose duplex receptacles (four minimum) and a quad receptacle at each workstation
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in room
- Lighting:
  - ✓ LED Lighting in accordance with IES recommendation (35 fc average)
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (as required).

PRIVATE OFFICE - 100 SF





FUNCTION

Private office for completing work tasks and holding one on one meetings.

RELATIONSHIP TO OTHER AREAS

- Case specific (office areas specific to each group); reference general modules

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

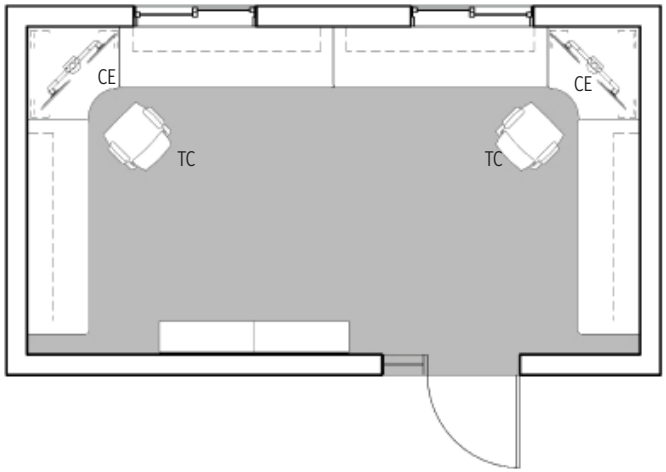
EQUIPMENT/FURNISHINGS

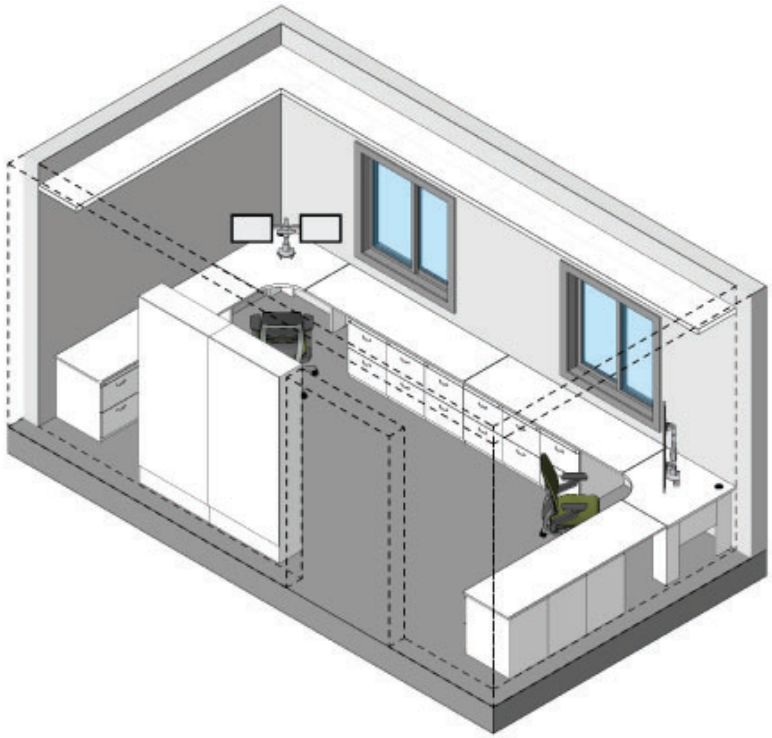
- Task chair
- TMC 60" by 30" typical sit/ stand workstation
- Two pedestal cabinets per station. One two-drawers for files, and one three-drawers for personal items and files
- Guest chairs

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring:
    - Carpet tile floor with rubber base for operation and administration areas. Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
    - Resilient floor covering with base for maintenance areas
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile
  - ✓ Doors:
    - Single leaf 3'-0" door with sidelight and lockable lever set hardware
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ Provide general purpose duplex receptacles (four minimum) and a quad receptacle at each workstation
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in room
- Lighting:
  - ✓ LED Lighting in accordance with IES recommendation (35 fc average)
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (as required).

SHARED OFFICE





FUNCTION

Shared office for completing work tasks and holding one on one meetings.

RELATIONSHIP TO OTHER AREAS

- Case specific (office areas specific to each group); reference general modules

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

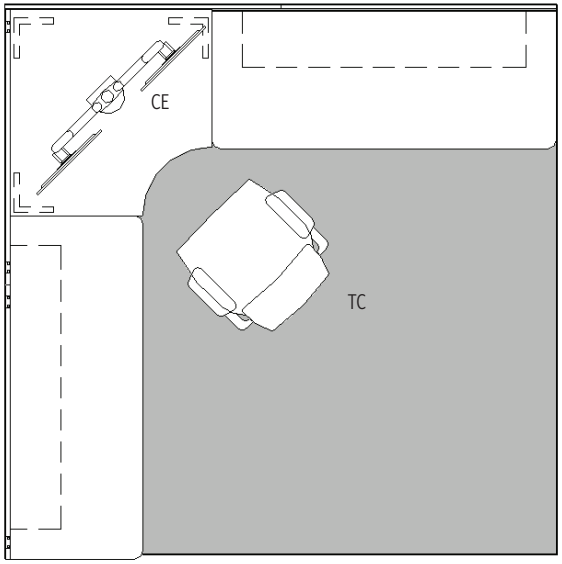
EQUIPMENT/FURNISHINGS

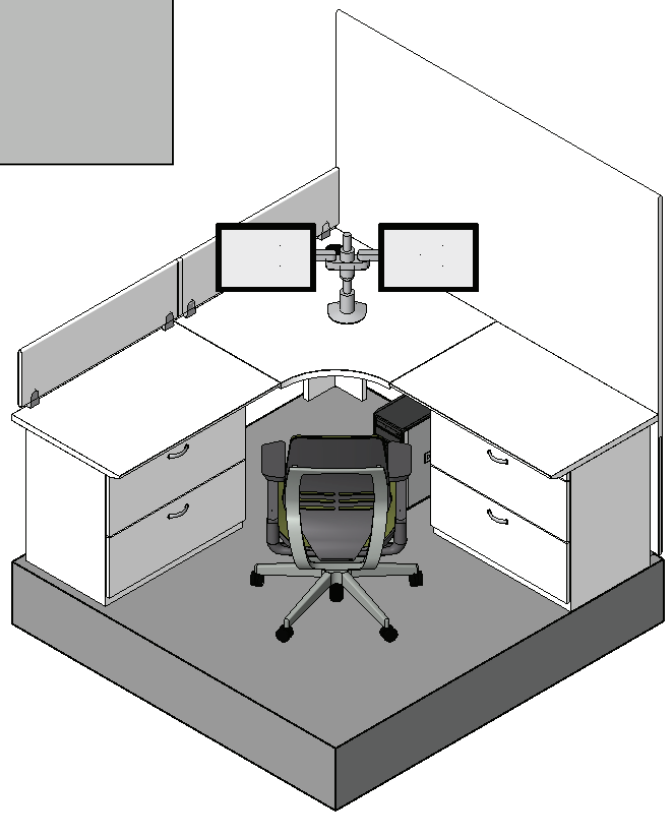
- Task chair
- TMC 60" by 30" typical sit/ stand workstation
- Two pedestal cabinets per station. One two-drawers for files, and one three-drawers for personal items and files
- Guest chairs

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring:
    - Carpet tile floor with rubber base for operation and administration areas. Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
    - Resilient floor covering with base for maintenance areas
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile
  - ✓ Doors:
    - Single leaf 3'-0" door with sidelight and lockable lever set hardware
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ Provide general purpose duplex receptacles (four minimum) and a quad receptacle at each workstation
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in room
- Lighting:
  - ✓ LED Lighting in accordance with IES recommendation (35 fc average)
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (as required).

WORKSTATION - 64 SF





FUNCTION

Open office workstation to complete work tasks.

RELATIONSHIP TO OTHER AREAS

- Case specific (office areas specific to each group); reference general modules

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

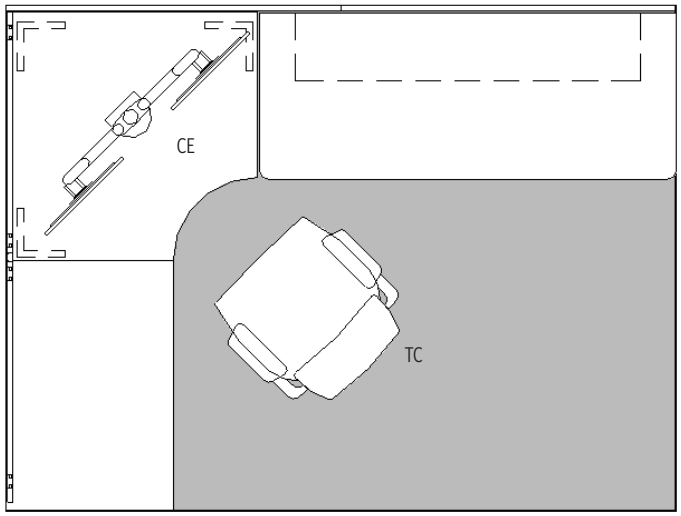
EQUIPMENT/FURNISHINGS

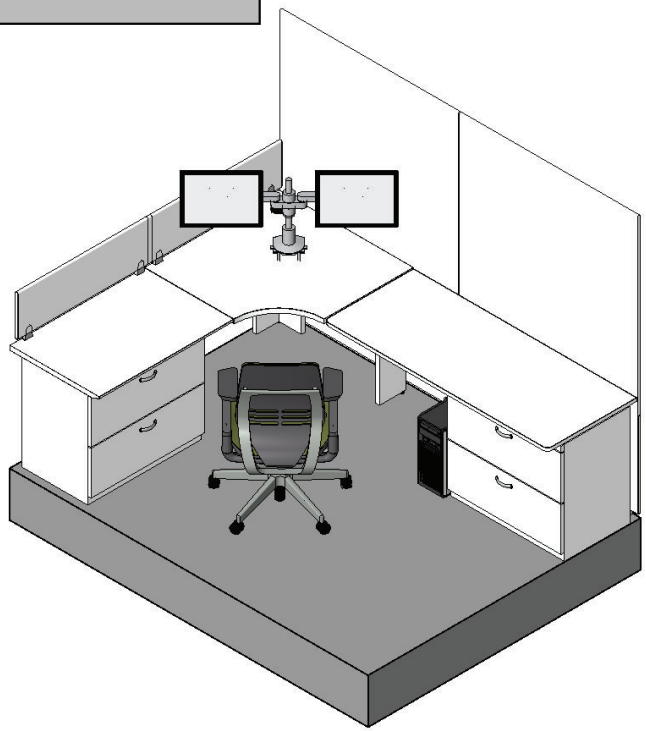
- Task chair
- TMC 60" by 30" typical sit/stand workstation
- Two pedestal cabinets per station. One two-drawers for files, and one three-drawers for personal items and files

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring:
    - Carpet tile floor with rubber base for operation and administration areas. Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
    - Resilient floor covering with base for maintenance areas
  - ✓ Ceiling: Acoustical ceiling tile
- Daylighting: Access to natural light
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ Provide general purpose duplex receptacles (three minimum) and a quad receptacle at workstation
  - ✓ Provide one data outlet with four data ports at workstation
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation (35 fc average)
  - ✓ Verify feasibility of providing individual control of selected luminaires
  - ✓ Task lighting (as required).

WORKSTATION - 48 SF





FUNCTION

Open office workstation to complete work tasks.

RELATIONSHIP TO OTHER AREAS

- Case specific (office areas specific to each group); reference general modules

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

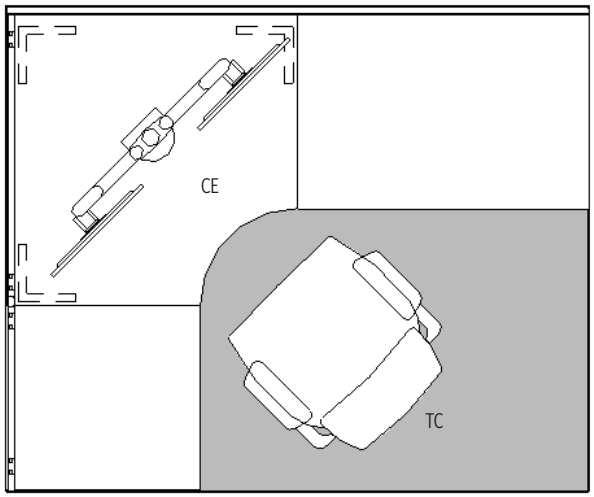
EQUIPMENT/FURNISHINGS

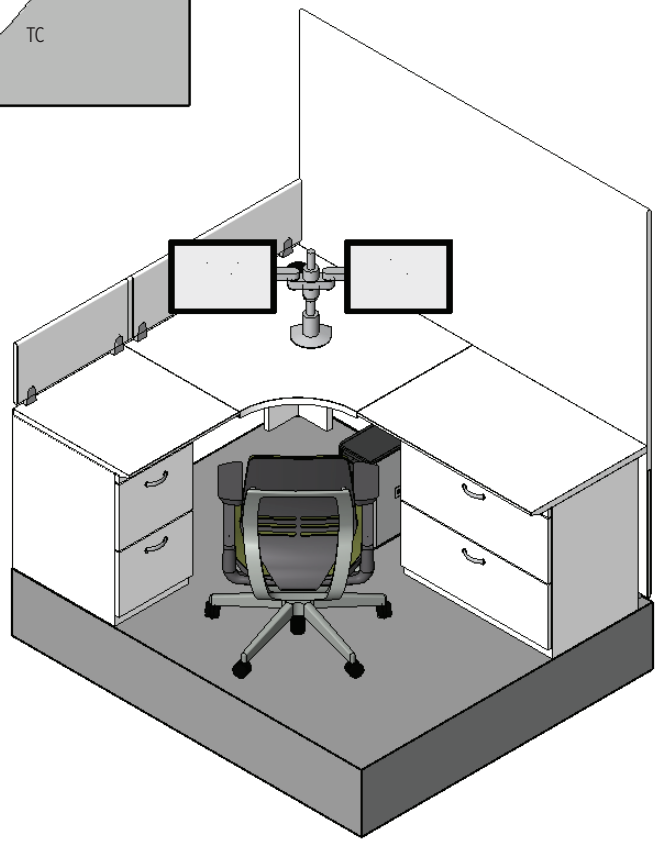
- Task chair
- TMC 60" by 30" typical sit/stand workstation
- Two pedestal cabinets per station. One two-drawers for files, and one three-drawers for personal items and files

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring:
    - Carpet tile floor with rubber base for operation and administration areas. Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
    - Resilient floor covering with base for maintenance areas
  - ✓ Ceiling: Acoustical ceiling tile
- Daylighting: Access to natural light
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ Provide general purpose duplex receptacles (three minimum) and a quad receptacle at workstation
  - ✓ Provide one data outlet with four data ports at workstation
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation (35 fc average)
  - ✓ Verify feasibility of providing individual control of selected luminaires
  - ✓ Task lighting (as required).

WORKSTATION - 30 SF AND 36 SF





FUNCTION

Open office workstation to complete work tasks.

RELATIONSHIP TO OTHER AREAS

- Case specific (office areas specific to each group); reference general modules

CRITICAL DIMENSIONS

- 9’-0” vertical clearance (minimum)

EQUIPMENT/FURNISHINGS

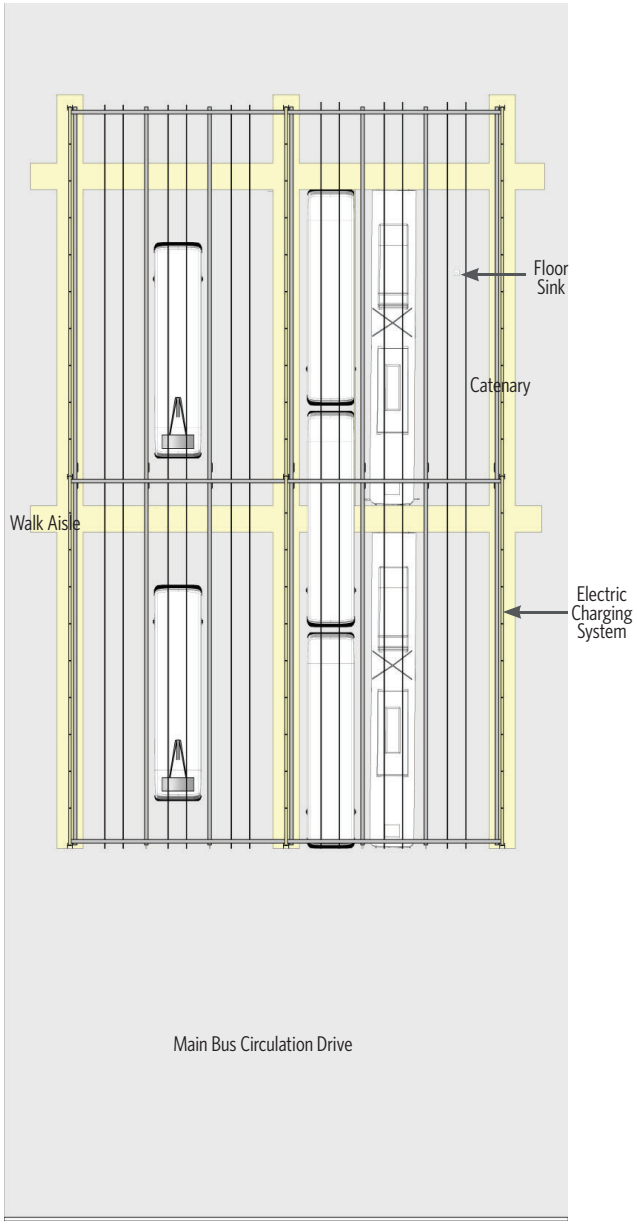
- Task chair
- TMC 60” by 30” typical sit/stand workstation
- Two pedestal cabinets per station. One two-drawers for files, and one three-drawers for personal items and files

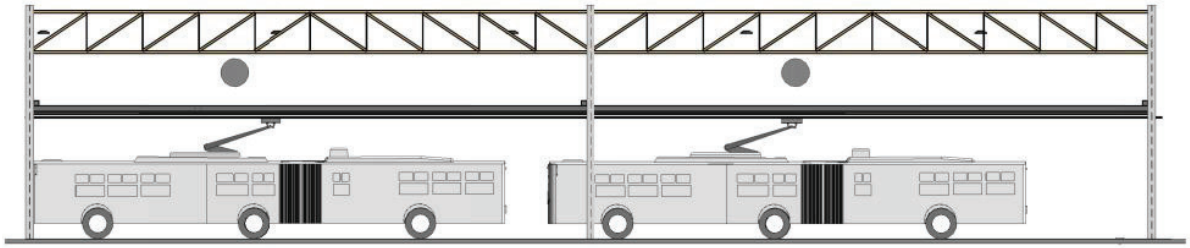
DESIGN FEATURES

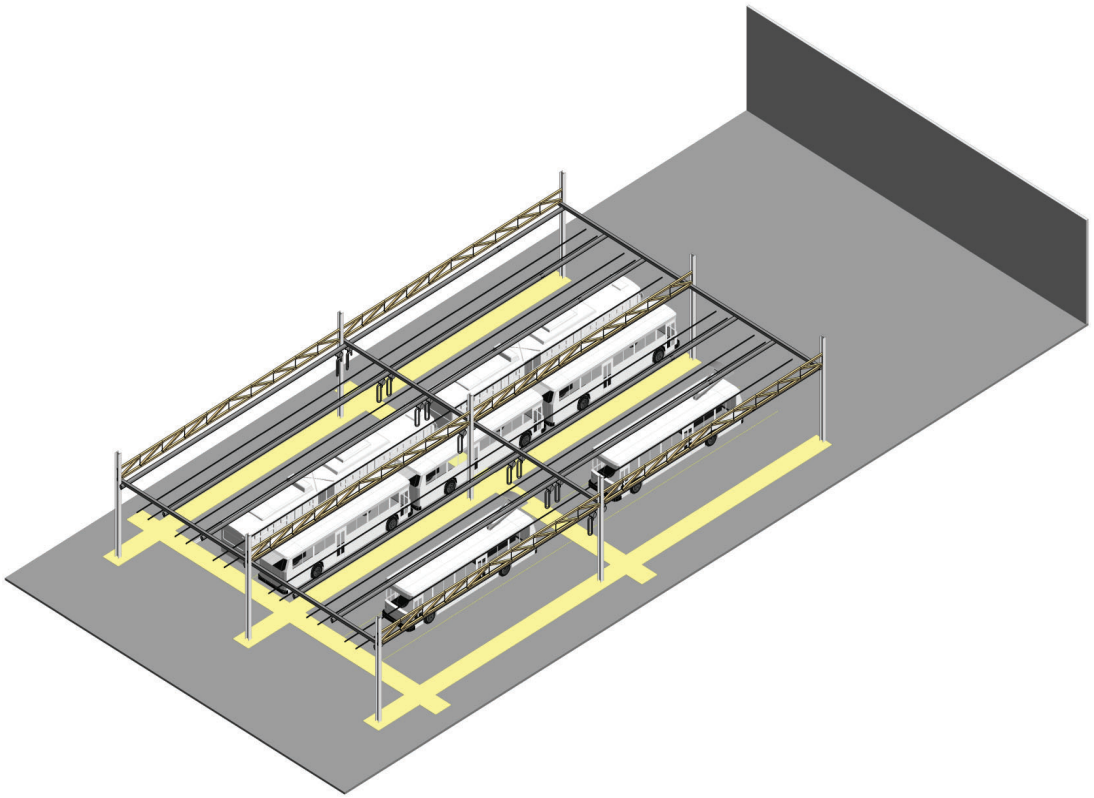
- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring:
    - Carpet tile floor with rubber base for operation and administration areas. Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
    - Resilient floor covering with base for maintenance areas
  - ✓ Ceiling: Acoustical ceiling tile
- Daylighting: Access to natural light
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ Provide general purpose duplex receptacles (three minimum) and a quad receptacle at workstation
  - ✓ Provide one data outlet with four data ports at workstation
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation (35 fc average)
  - ✓ Verify feasibility of providing individual control of selected luminaires.
  - ✓ Task lighting (as required).

SECTION 5.2: PARKING

40’ AND 60’ BUS PARKING







40’ AND 60’ BUS PARKING

FUNCTION

Dedicated area to park 40’ and 60’ trolleys.

RELATIONSHIP TO OTHER AREAS

- Access to Service Positions
- Access to Bus Washer

CRITICAL DIMENSIONS

- 19’-0” preferred vertical clearance to structure and fixtures. This vertical clearance height may be reduced to a minimum of 17’ only if all fixtures, building systems, OCS, ETB pole systems, structure, and all other Technical Requirements are fully accommodated.
- 12’-0” wide x 65’-0” long per space (60’ bus)
- 12’-0” wide x 45’-0” long per space (40’ bus)
- Ramps:
  - ✓ 15’-0” wide ramp (minimum)
  - ✓ 14’-0” vertical clearance to structure and fixtures
  - ✓ Maximum 10 percent slope with 40’ long 5 percent transition ramps at top and bottom

EQUIPMENT/FURNISHINGS

- OCS: Wire in parking positions for trolley buses
- Electric charging: Reference E-Bus Performance Requirements. This E-Bus Performance Requirements Document supersedes anything in this document.

DESIGN FEATURES

- Buses parking in each aisle of every bus parking level must be organized by buses of the same length. Further, each bus parking aisle shall be designated for its respective bus length so that the charging infrastructure can be efficiently accommodated.
- Pulling out from the facility needs to be further evaluated in final design because of the affects of going on wire could have on backups or delays at pullout. A couple of options are:
  - ✓ Having wires connected to the street wires from inside the building so that going on wire would happen in a parking que lane at the exit of the facility.
  - ✓ Have the buses go on wire at different locations on the street depending on their route. One block after pullout, another 5 blocks after pullout, and so on.

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finish, concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish
- Doors:
  - ✓ Personnel door with view panel to meet applicable code exit requirements
  - ✓ Exterior of building overhead doors: High-lifting sectional, steel, insulated, size per Fleet 16’-0” wide by 16’-0” with view panels, automatic operator, detection loops
  - ✓ Bollards on exterior at jambs of overhead door (two each)

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment

MECHANICAL CONSIDERATIONS

- Ventilation:
  - ✓ 1.5 CFM exhaust per square foot of floor area
  - ✓ Return air openings in areas used for repair or servicing vehicles shall not be less than 18” above floor level accordance with NFPA 30A and ASHRAE 62.1
- Heating set point: 65 degrees Fahrenheit

PLUMBING CONSIDERATIONS

- Trench drain at overhead door with flush, removable grate covers, with sediment basket upstream of trap, to central sediment and oil interceptor.
- 3/4” water hose bibb with standard faucet at rear of bay 2’-0” AFF (one per three bays)
- Compressed air:
  - ✓ 2’-0” compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge and quick disconnects on 4’-0” AFF (one per four parking stalls)
  - ✓ Provide 3/8” and 1/2” disconnects at locations to be determined during detailed design
  - ✓ As required by equipment
- Additional plumbing connections (water, drainage, etc.) as required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3’-6” AFF
  - ✓ Provide general purpose duplex receptacles on every column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation (5 fc average)
  - ✓ Fixtures located to illuminate work spaces and around the vehicles
  - ✓ Luminaires shall be placed between every row of buses to allow illumination between buses
- Communications: Paging/intercom system speakers with 100 percent coverage of all parking stalls

SECTION 5.3:BAYS AND SHOPS

GENERAL NOTES

- Provide one Preventive Maintenance Bay for every 50 buses
- All Maintenance Bays are designed for 40’ and 60’ buses
- The above are all industry standards. Reference Appendix C: Equipment Manual for industrial shop equipment specified per space.

GENERAL OFFICE MODULES: OFFICE AREAS

RUNNING REPAIR - SUPERVISOR

- Reference **Office Module Workstation - 64 sf**
- View of Repair Bays and Shops
- Adjacent to Preventive Maintenance Supervisor

CONTROL ROOM CLERK

- Reference **Office Module Workstation - 64 sf**
- Adjacent to Supervisors

FLOOR SUPERVISOR

- Reference **Office Module Workstation - 64 sf**
- View of Repair Bays and Shops

PREVENTIVE MAINTENANCE SUPERVISOR

- Reference **Office Module Workstation - 64 sf**
- View of Repair Bays and Shops
- Adjacent to Running Repair Supervisor

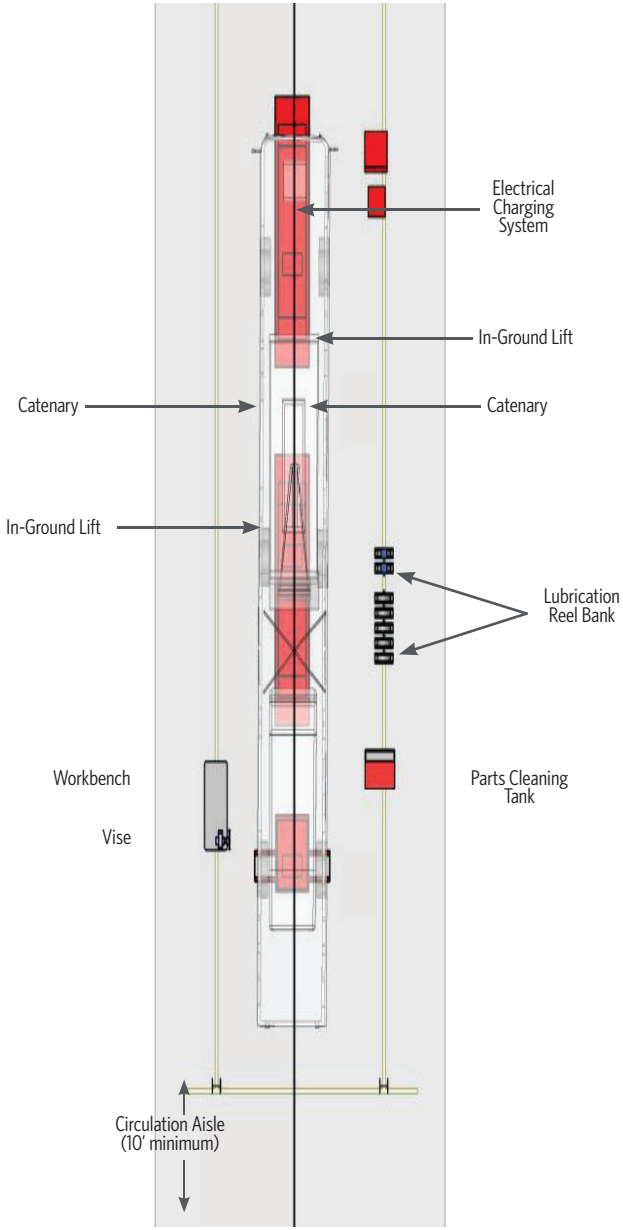
ELECTRONIC SUPERVISOR

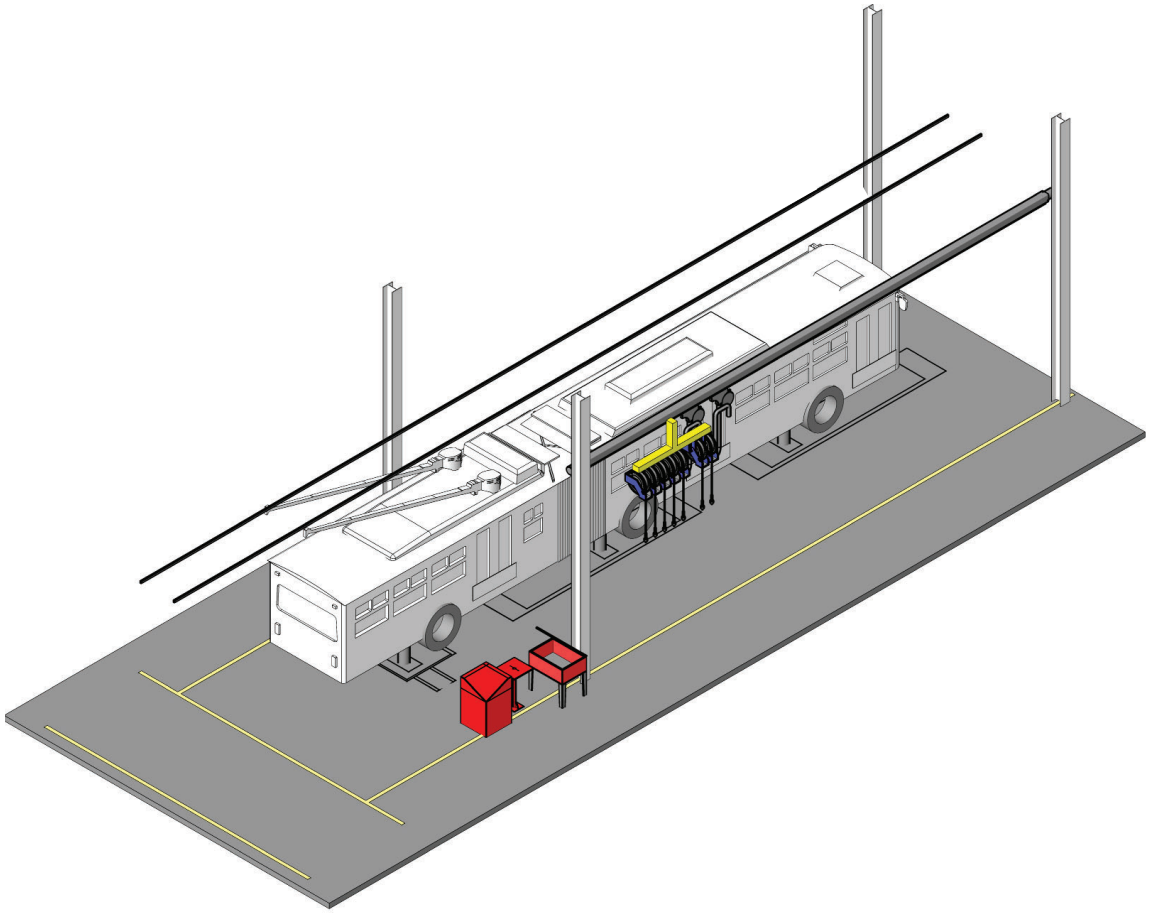
- Reference **Office Module Workstation - 64 sf**
- View of Repair Bays and Shops
- Adjacent to Supervisors
- Access to Electronic Bench Shop

ELECTRONIC SHOP WORKSTATIONS

- Reference **Office Module Workstation - 30 sf**
- Adjacent to Electronic Bench Shop

60' BUS REPAIR BAY





60' BUS REPAIR BAY

FUNCTION

Bay space to perform general repair and maintenance on trolleys and future BEBs.

RELATIONSHIP TO OTHER AREAS

- Access to Common Work Area, Parts Storage, Portable Equipment Storage Areas, and Maintenance Office areas

CRITICAL DIMENSIONS

- 19'-0" vertical clearance to structure and fixtures
- 20'-0" wide by 75'-0" long

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment
- OCS: Wire in positions for trolley buses
- Electric charging: Reference E-Bus Performance Requirements. This E-Bus Performance Requirements Document supersedes anything in this document.

DESIGN FEATURES

- Forklift access
- Natural daylighting desired
- Roof Level Work Platform (RLWP) with fall protection

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access

MECHANICAL CONSIDERATIONS

- As required by equipment
- Ventilation:
  - ✓ 1.5 CFM exhaust per square foot of floor area
  - ✓ Return air openings in areas used for repair or servicing vehicles shall not be less than 18" above floor level accordance with NFPA 30A and ASHRAE 62.1
- Heating set point: 65 degrees Fahrenheit
- In-floor radiant heat (if desired)

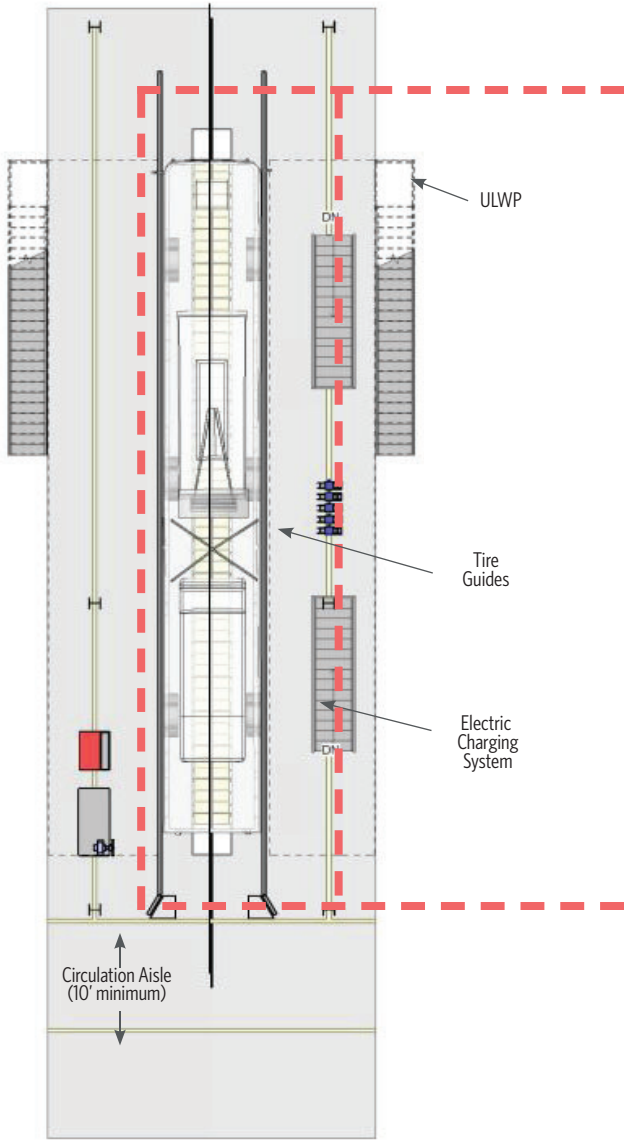
PLUMBING CONSIDERATIONS

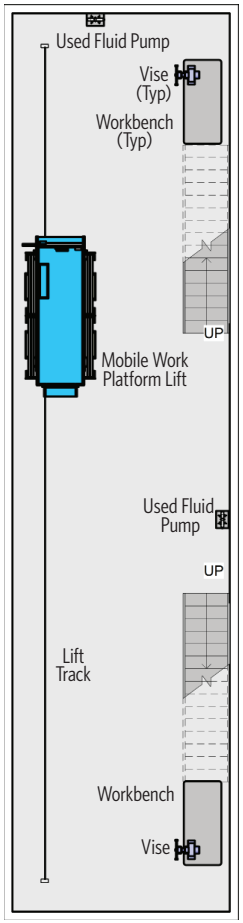
- Lubrication reel bank (shared one per two bays)
- 3/4" water hose bibb with standard faucet at rear of bay 2'-0" AFF (one per three bays)
- Compressed air:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- Additional plumbing connections (water, drainage, etc.) as required by equipment

ELECTRICAL CONSIDERATIONS

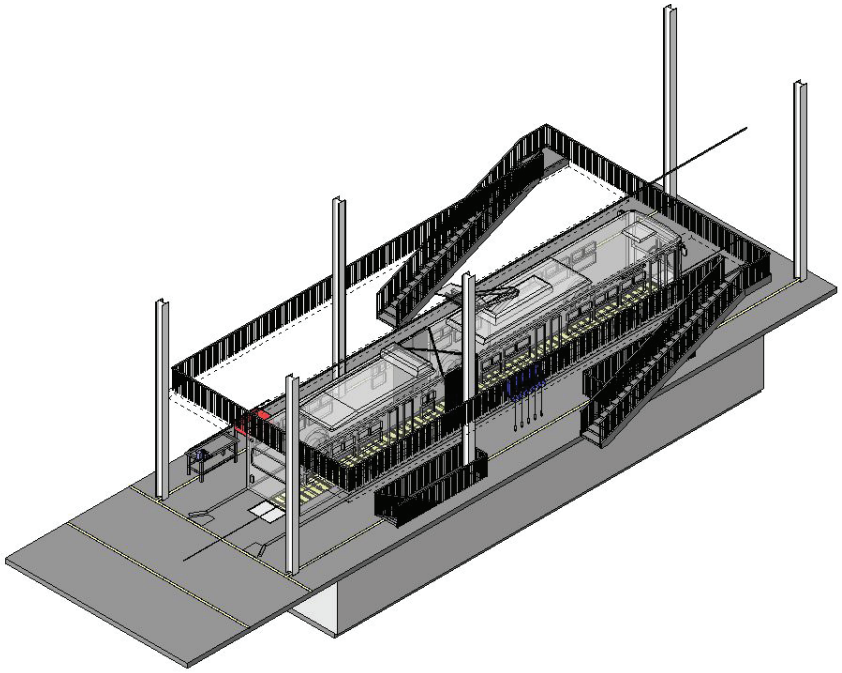
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (four minimum) on walls, columns, and between overhead doors
  - ✓ Dedicated computer receptacle, adjacent to data conduit on column adjacent to workbench
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (75 fc average)
  - ✓ Fixtures located to illuminate work spaces and around the vehicles
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns at each bay

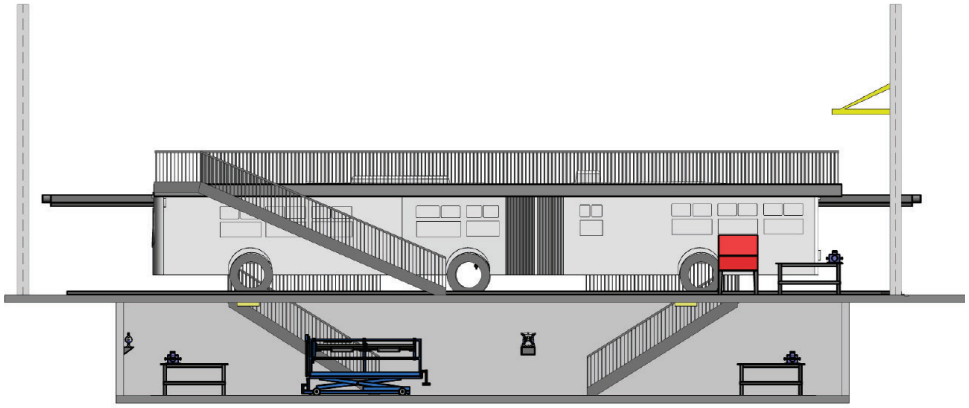
60' BUS PREVENTIVE MAINTENANCE





LLWA





60' BUS PREVENTIVE MAINTENANCE

FUNCTION

Bay space to perform preventive maintenance such as inspections, and underfloor component replacement or repair on trolleys, and future battery electric buses with a Lower Level Work Area (LLWA). As well as, roof top component repair or replacement with an Upper Level Work Platform (ULWP) are performed in this area as well.

RELATIONSHIP TO OTHER AREAS

- Access to Common Work Area, Parts Storage, Portable Equipment Storage Areas, and Maintenance Office areas

CRITICAL DIMENSIONS

- 19'-0" vertical clearance to structure and fixtures
- 20'-0" wide by 75'-0" long
- LLWA: 60'-0" long by 10'-0" wide by 8'-6" depth (min.)
- 25'-0" (min) vertical clearance within the bay where bus is in position.

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment
- Electric charging: Reference E-Bus Performance Requirements. This E-Bus Performance Requirements Document supersedes anything in this document.
- Lockout/tag out system required when bus is in position
- No OCS: Wire in position for trolley buses.

DESIGN FEATURES

- Forklift access
- Natural daylighting desired
- LLWA
- ULWP
- Tire guides are required to assist with the maneuvering into the bay
- Lockout/tag out system for access to ULWP
- Trolley pole system inspection and maintenance to be conducted in all PM Bays. Reference diagram in section 3.6 OCS-Trolley for height diagram.
- Multiple PM bays should be located adjacent to one another and the LLWA for each should be contiguous from one to another, to allow for uninhibited passage from one LLWA to the next LLWA across the entire length of the LLWA.

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access
- LLWA opening to support bridge jacks

MECHANICAL CONSIDERATIONS

- As required by equipment
- Ventilation:
  - ✓ 1.5 CFM exhaust per square foot exhaust
  - ✓ Return openings in areas used for repair or servicing vehicles shall not be less than 18" above floor level accordance with NFPA 30A and ASHRAE 62.1
- Heating set point: 65 degrees Fahrenheit
- In-floor radiant heat (if desired)
- LLWA:
  - ✓ Minimum 1 CFM per square foot of LLWA floor area at all times the building is occupied or when vehicles are parked over these areas.
  - ✓ Exhaust shall be taken from a point within 1'-0" of the floor

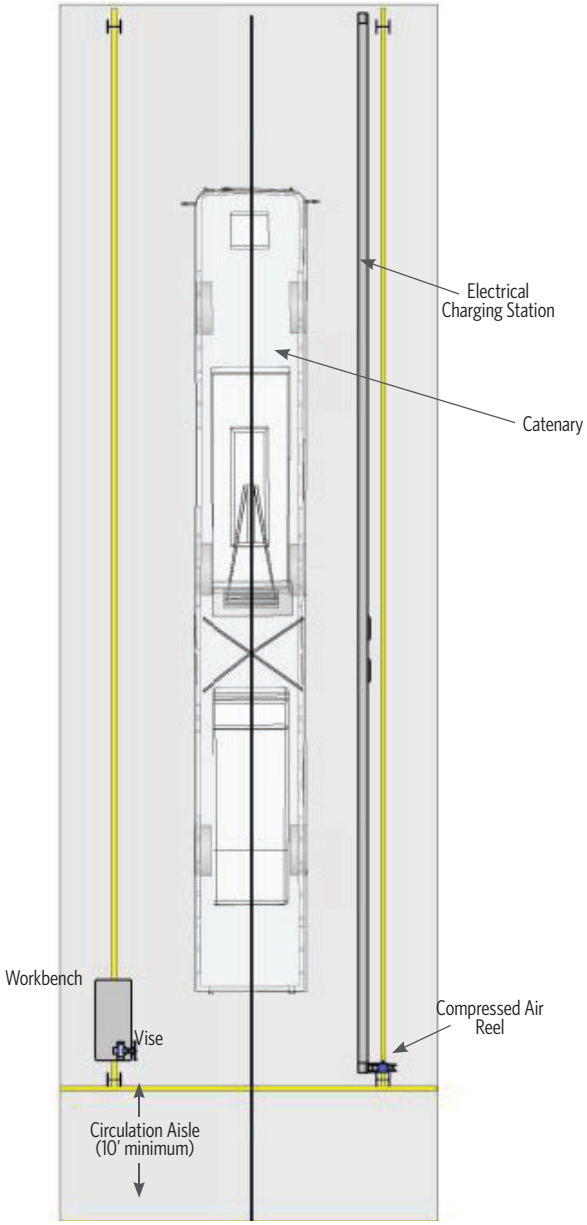
PLUMBING CONSIDERATIONS

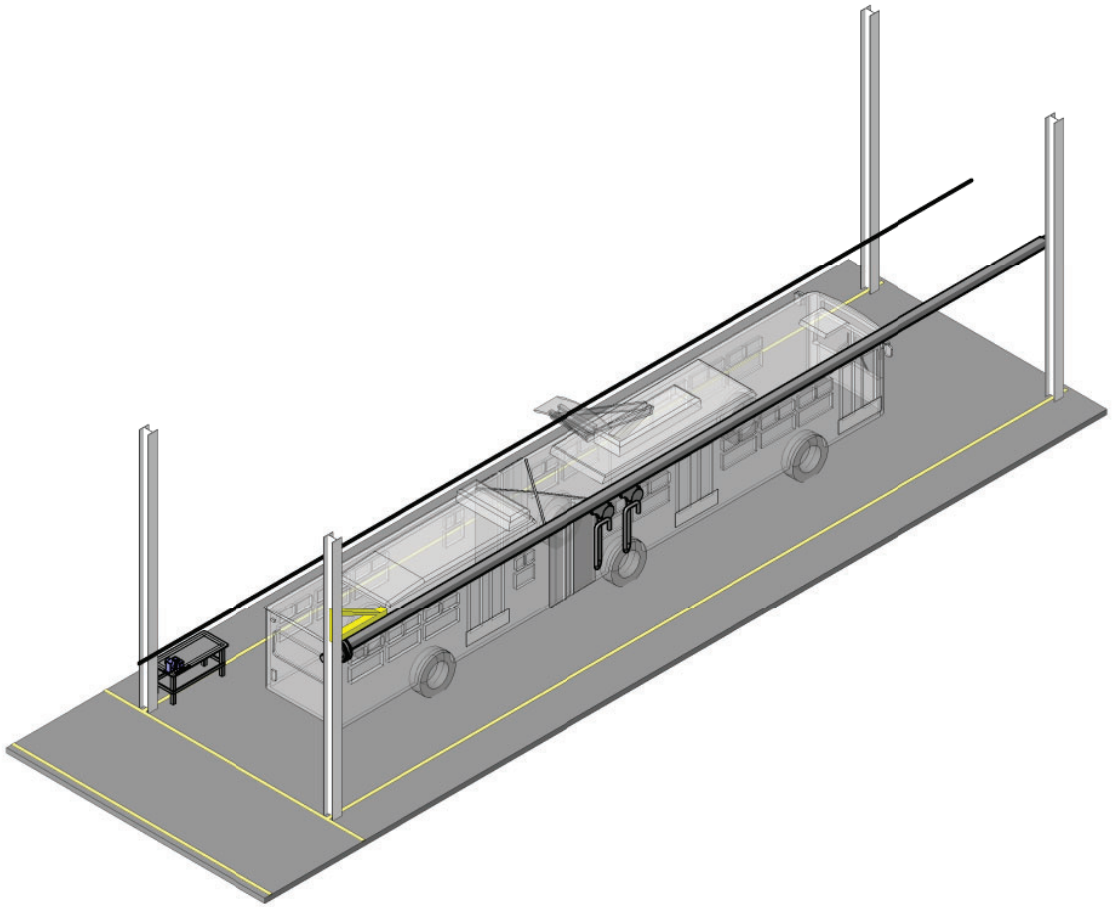
- 3/4" water hose bibb with standard faucet at rear of bay on main and LLWA level, 2'-0" AFF (one per bay)
- Compressed air:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ Provide on Main Level, ULWP, and LLWA
  - ✓ As required by equipment
- Additional plumbing connections (water, drainage, etc.) as required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (four minimum) on walls, columns, and between overhead doors
  - ✓ Dedicated computer receptacle, adjacent to data conduit on column adjacent to workbench
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (75 fc average)
  - ✓ Explosion proof LED lighting in pit
  - ✓ Fixtures located to illuminate work spaces and around the vehicles
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns at each bay

60’ BUS TIRE BAY





60' BUS TIRE BAY

FUNCTION

Bay space to perform tire replacement and repair on trolleys and future BEBs.

RELATIONSHIP TO OTHER AREAS

- Access to Common Work Area, Parts Storage, Portable Equipment Storage Areas, and Maintenance Office areas
- Adjacent to Tire Shop

CRITICAL DIMENSIONS

- 19'-0" vertical clearance to structure and fixtures
- 20'-0" wide by 75'-0" long

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment
- Electric charging: Reference E-Bus Performance Requirements. This E-Bus Performance Requirements Document supersedes anything in this document.
- OCS: Wire in positions for trolley buses

DESIGN FEATURES

- Forklift access
- Natural daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access

MECHANICAL CONSIDERATIONS

- As required by equipment
- Ventilation:
  - ✓ 1.5 CFM exhaust per square foot of floor area
  - ✓ Return air openings in areas used for repair or servicing vehicles shall not be less than 18" above floor level accordance with NFPA 30A and ASHRAE 62.1
- Heating set point: 65 degrees Fahrenheit
- In-floor radiant heat (if desired)

PLUMBING CONSIDERATIONS

- Lubrication reel bank (shared one per two bays)
- 3/4" water hose bibb with standard faucet at rear of bay 2'-0" AFF (one per three bays)
- Compressed air:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- Additional plumbing connections (water, drainage, etc.) as required by equipment

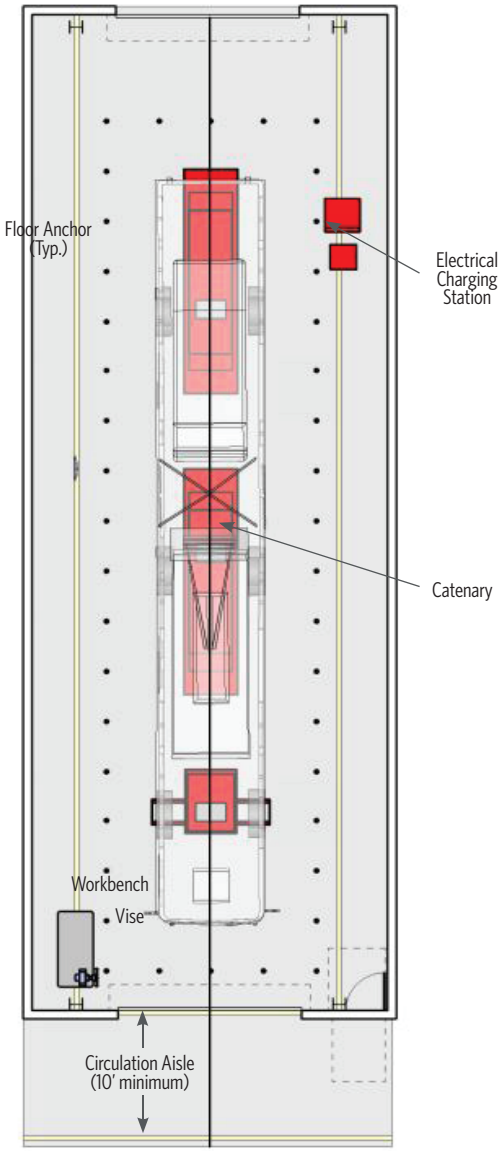
ELECTRICAL CONSIDERATIONS

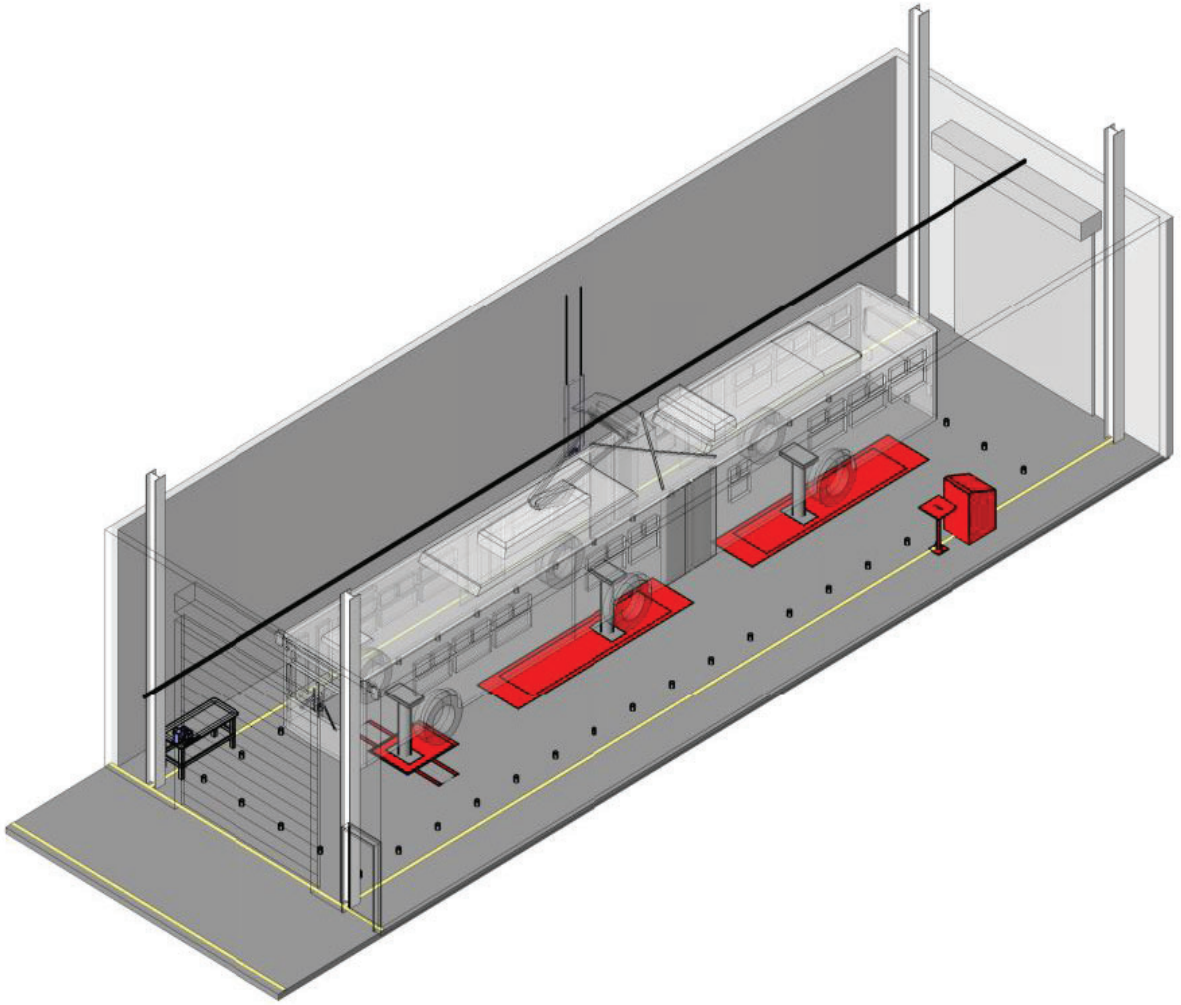
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (four minimum) on walls, columns, and between overhead doors
  - ✓ Dedicated computer receptacle, adjacent to data conduit on column adjacent to workbench
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (25 fc average)
  - ✓ Fixtures located to illuminate work spaces and around the vehicles
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns at each bay

FIRE SUPPRESSION CONSIDERATIONS

The fire protection and pyrotechnics experts on the detailed design team will be responsible for devising a robust fire protection system for the tire bay and tire shop/storage areas that minimizes risk to the Yard and any joint development above. Review and recommendations provided by the experts will include, but not be limited to, the location, ventilation, and fire suppression systems for Potrero Yard's tire facilities.

60’ BUS MINOR BODY REPAIR





60’ BUS MINOR BODY REPAIR

FUNCTION

Perform minor replacement and repair of glass panel and other body parts of the trolley and future BEBs.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Minor Body Shop

CRITICAL DIMENSIONS

- 19’-0” vertical clearance to structure and fixtures
- 20’-0” wide by 75’-0” long

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment
- Electric charging: Reference E-Bus Performance Requirements. This E-Bus Performance Requirements Document supersedes anything in this document.
- OCS: Wire in positions for trolley buses

DESIGN FEATURES

- Forklift access
- Natural daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish
- Doors:
  - ✓ Personnel door with view panel to meet applicable code exit requirements
  - ✓ Overhead door: High-lifting sectional, steel, insulated, 14’-0” by 14’-0” with view panels, automatic operator, interior and exterior push button controls

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access

MECHANICAL CONSIDERATIONS

- As required by equipment
- Ventilation:
  - ✓ 1.5 CFM exhaust per square foot of floor area
  - ✓ Return air openings in areas used for repair or servicing vehicles shall not be less than 18” above floor level accordance with NFPA 30A and ASHRAE 62.1
- Heating set point: 65 degrees Fahrenheit
- In-floor radiant heat (if desired)

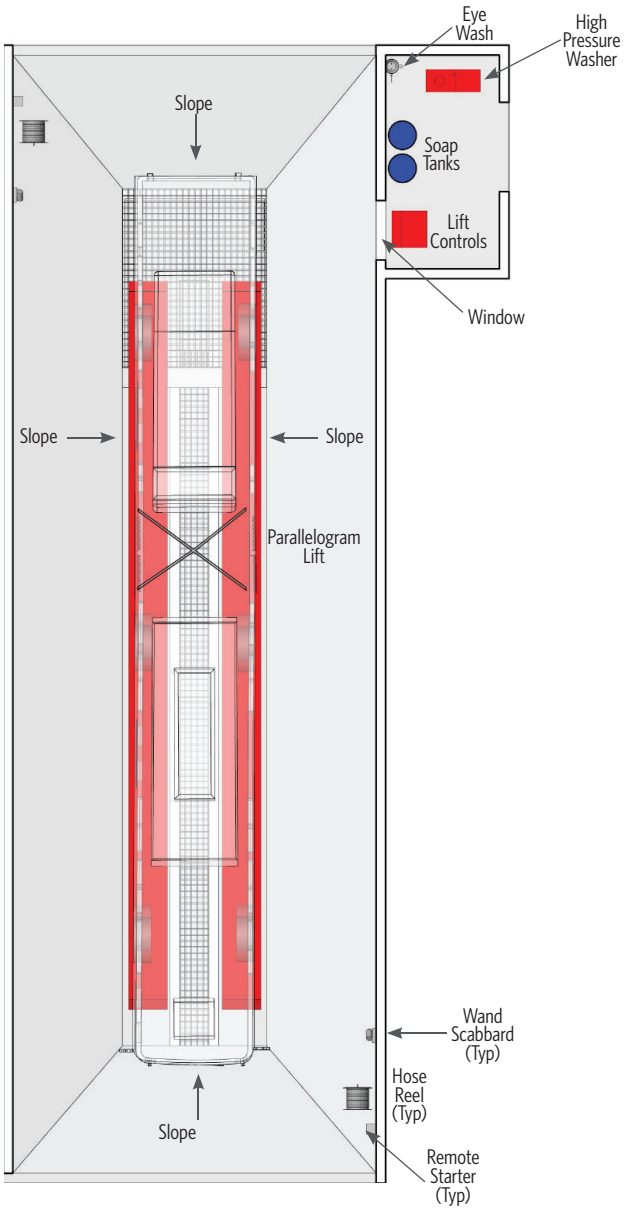
PLUMBING CONSIDERATIONS

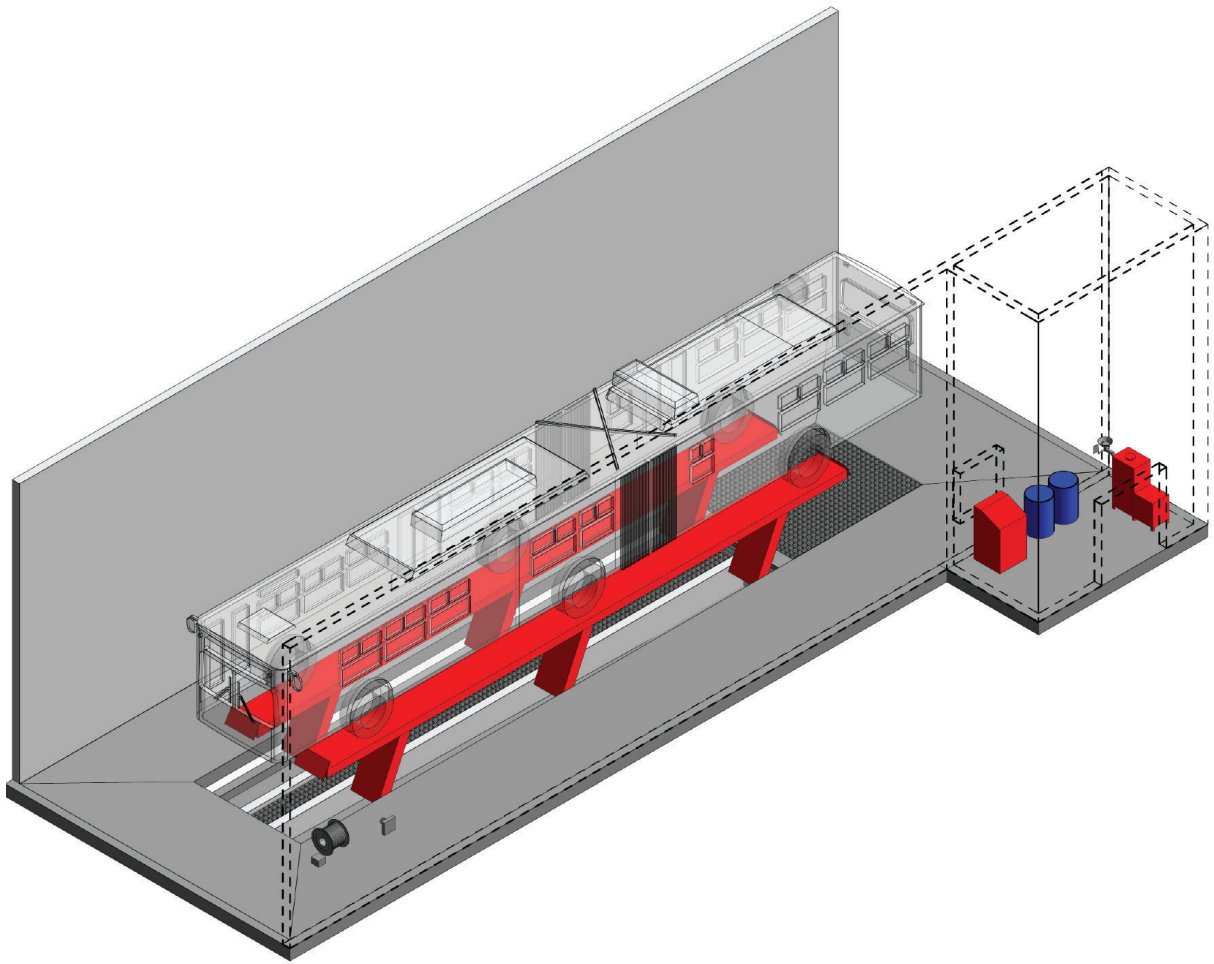
- Lubrication reel bank (shared one per two bays)
- 3/4” water hose bibb with standard faucet at rear of bay 2’-0” AFF (one per three bays)
- Compressed air:
  - ✓ 2’-0” compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4’-0” AFF
  - ✓ Provide disconnects for 3/8” and 1/2” impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- Additional plumbing connections (water, drainage, etc.) as required by equipment.

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3’-6” AFF
  - ✓ Provide general purpose duplex receptacles (four minimum) on walls, columns, and between overhead doors
  - ✓ Dedicated computer receptacle, adjacent to data conduit on column adjacent to workbench
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (75 fc average)
  - ✓ Fixtures located to illuminate work spaces and around the vehicles
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns at each bay

60' BUS CHASSIS WASH





60' BUS CHASSIS WASH

FUNCTION

Chassis Wash Bay: Enclosed bay for washing of underside of trolleys and future battery electric buses before bringing into repair bays. Wash Equipment Room: A room adjacent to the Wash Bay for high pressure washer and soap drums.

RELATIONSHIP TO OTHER AREAS

- Access to all other shop areas

CRITICAL DIMENSIONS

- 19'-0" vertical clearance
- 20'-0" wide by 75'-0" long

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment
- No OCS: Wire in position for trolley buses.

DESIGN FEATURES

- Forklift access
- Natural daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry, with polyurea coatings treatment for wet and moisture protection
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish
- Doors: Personnel doors with view panels to meet applicable code exit requirements

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structural grating over sump pit to accommodate H-20 loading
- Large grated sump with side drain for overflow
- Slope floor to trench drain and sump pit
- Structure as needed to support equipment

MECHANICAL CONSIDERATIONS

- Special ventilation to remove moisture
- Water resistant heating system
- In-floor radiant heating (if desired)
- As required by equipment
- Exhaust:
  - ✓ Minimum 10 air changes per hour when wash equipment is activated.
  - ✓ Minimum one air change per hour when wash equipment is inactive
- Heating set point: 55 degrees Fahrenheit

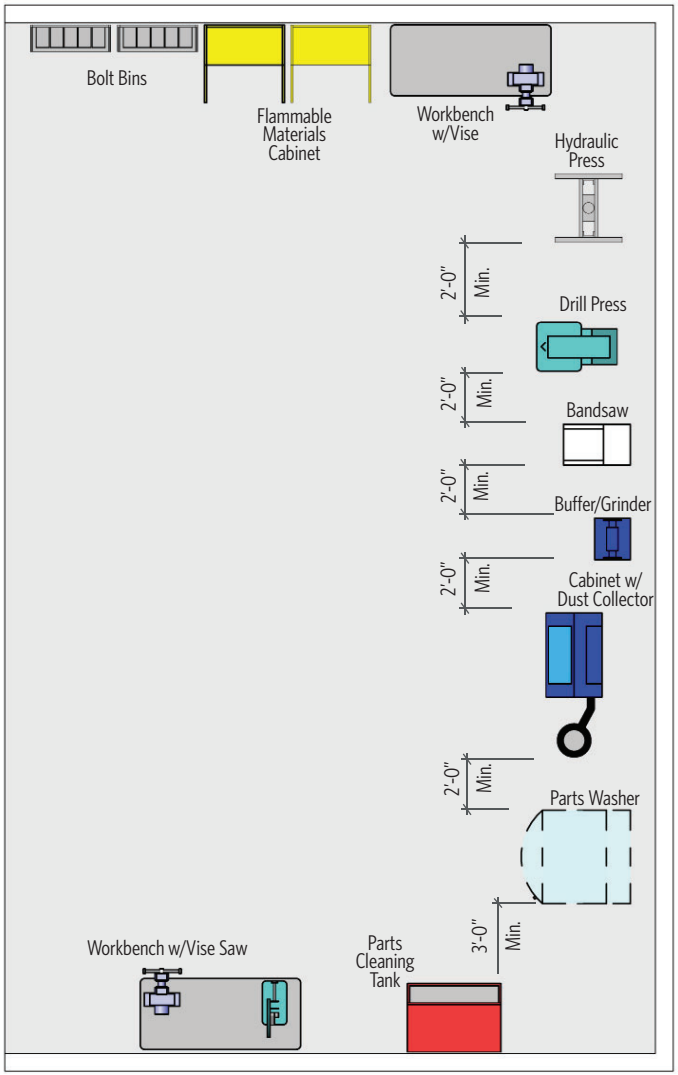
PLUMBING CONSIDERATIONS

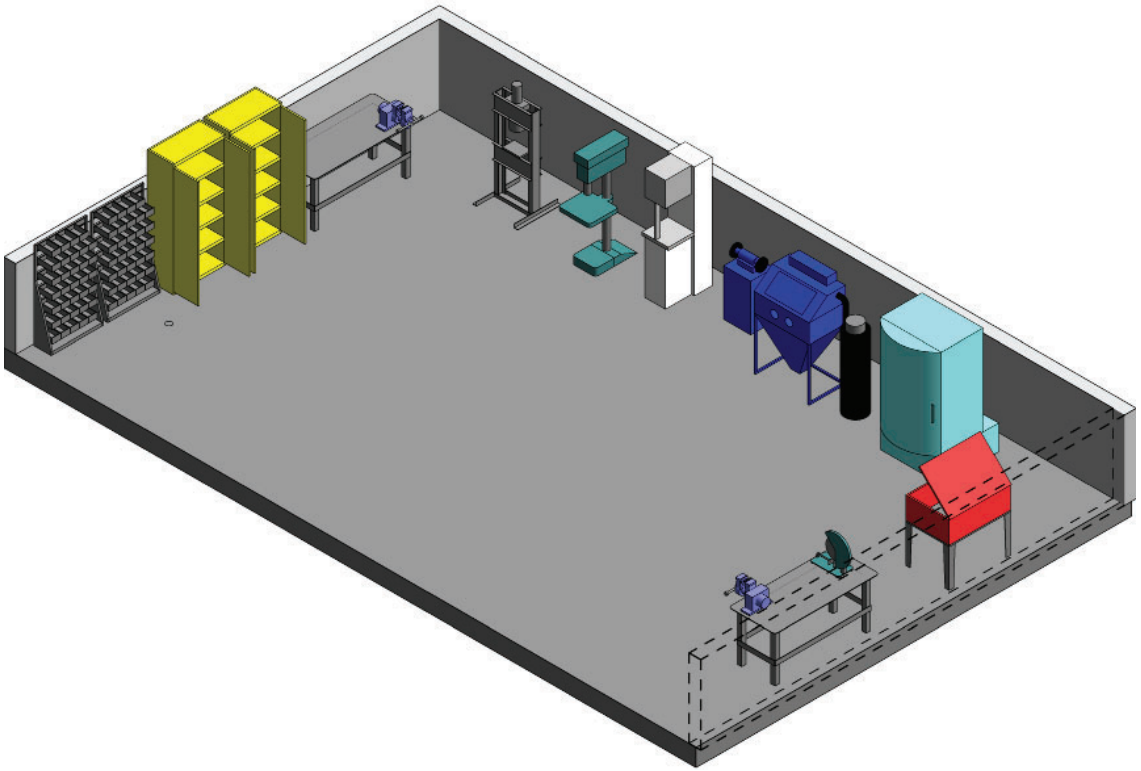
- Compressed air:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ As required by equipment
- Wash connections from high pressure washer to wand scabbard on both sides of bay
- Water connection to emergency eye wash/shower station
- Trench drain area (with removable cover), with sediment basket upstream of trap, to central sediment and oil inceptor
- Large grated sump with side drain overflow to central sediment and oil inceptor
- Additional plumbing connections (water, drainage, etc.) as required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide waterproof duplex receptacles (four minimum) on walls
- Lighting:
  - ✓ Sealed LED water tight lighting fixtures with no external reset device on walls (20 fc average)
  - ✓ Fixtures located to illuminate work space and around vehicles
- Communications: Paging/intercom system speakers

COMMON WORK AREA





COMMON WORK AREA

FUNCTION

Designated area for common fixed shop equipment which supports all repair bays and associated shop areas.

RELATIONSHIP TO OTHER AREAS

- Access from Maintenance Office areas
- Adjacent to Repair Bays, Parts Room, and Portable Equipment Storage
- Located on first floor

CRITICAL DIMENSIONS

- 12'-0" to vertical clearance to structure and fixtures

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Half-height 56" walls on three sides for utilities and to prevent blocking vision of shop from office areas and repair bays
- Forklift access
- Natural daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities, light colored finish
- Doors: None

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access

MECHANICAL CONSIDERATIONS

- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- In-floor radiant heat (if desired)
- As required by equipment

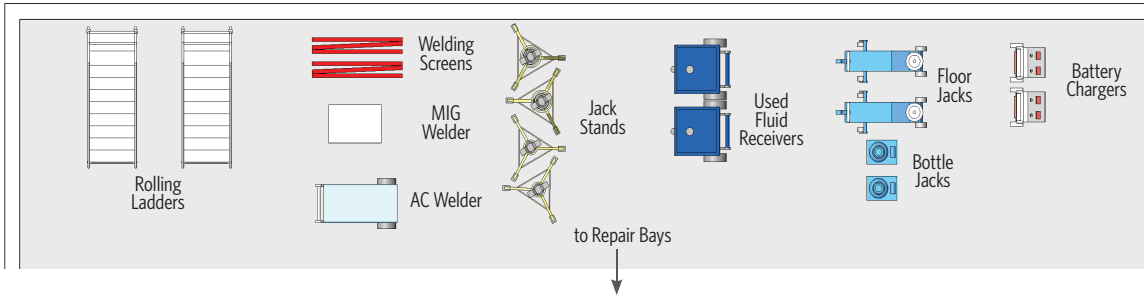
PLUMBING CONSIDERATIONS

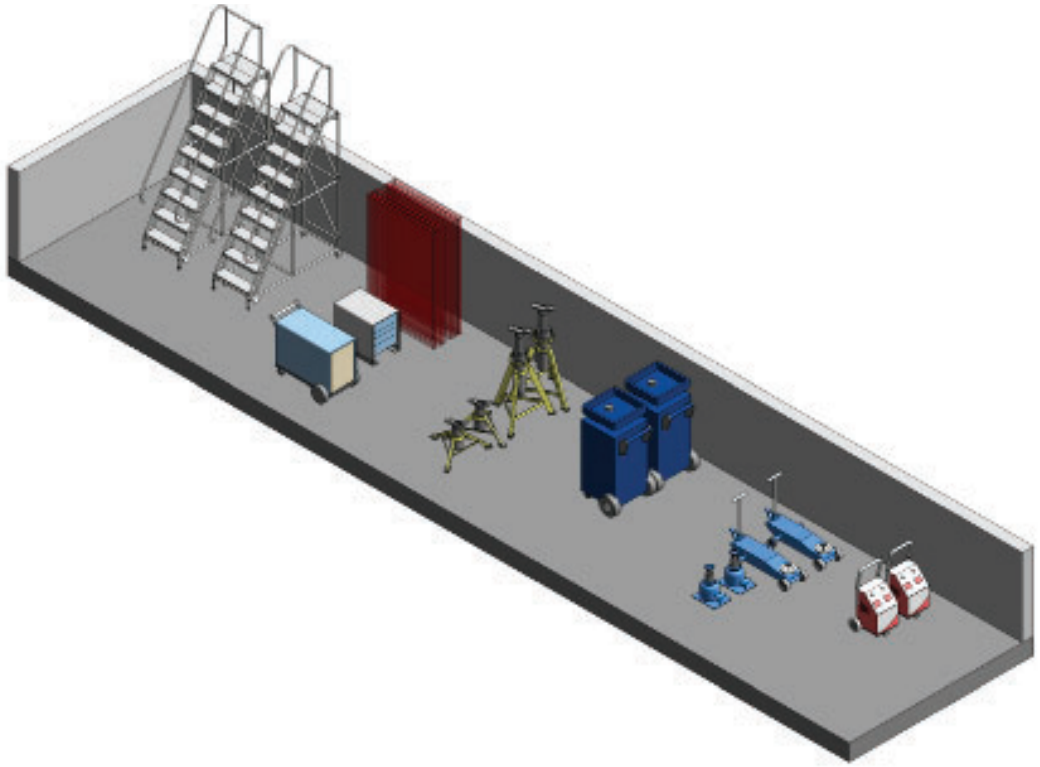
- Compressed air drop:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- Water: 3/4" water hose bibb with standard hose bibb at 2'-0" AFF
- Additional plumbing connections (water, drainage, etc.) as required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (50 fc average)
  - ✓ Fixtures located to illuminate work spaces
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

PORTABLE EQUIPMENT STORAGE





FUNCTION

A dedicated area for storage of portable shop equipment.

RELATIONSHIP TO OTHER AREAS

- Access to all Repair Bays and all shop areas

CRITICAL DIMENSIONS

- 12'-0" vertical clearance to structure and fixtures

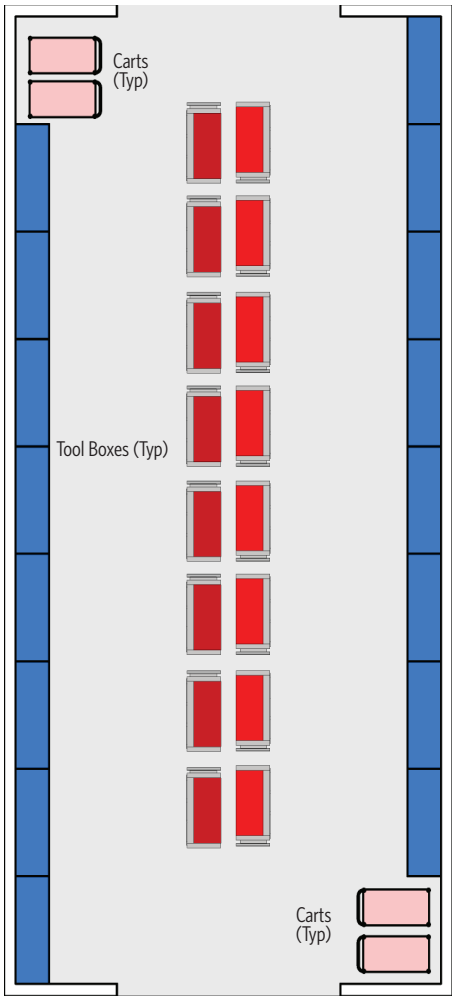
EQUIPMENT/FURNISHINGS

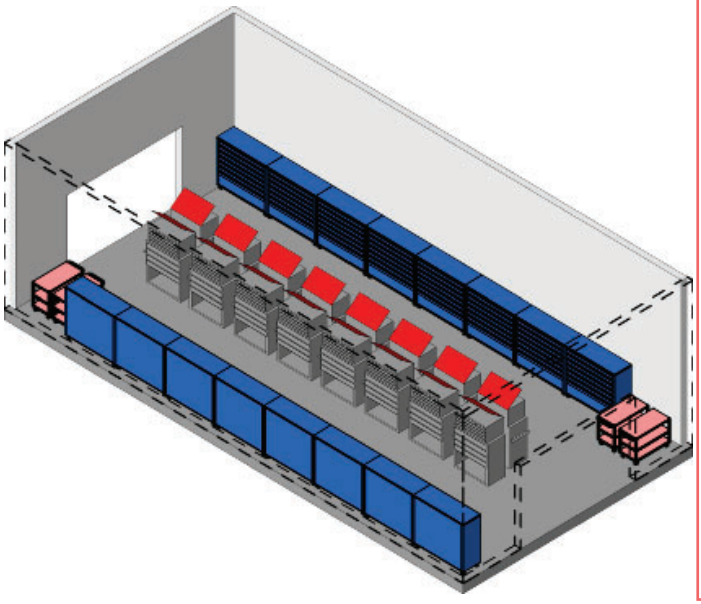
- Portable equipment including but not limited to: Service jacks, bottle jacks, jack stands, ladders, diagnostic equipment, used fluid drain pans, battery chargers, work platforms, welders, welding screens, etc.
- Typical equipment is shown, reference Appendix C: Equipment Manual for specific project equipment

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Soil, grease, water, slip resistant concrete with integral non-metallic light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finish concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish
- Structural:
  - ✓ Control joints in floor slab at adequate spacing
  - ✓ Floor slab to accommodate in-floor radiant heat (if desired)
  - ✓ Structure as needed to support equipment
  - ✓ Floor slab designed to accommodate forklift access
- Mechanical:
  - ✓ In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ As required by equipment
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (20 fc average)
  - ✓ Fixtures located to illuminate work spaces

TOOL BOX STORAGE





FUNCTION

Dedicated area for the storage of toolboxes and carts.

RELATIONSHIP TO OTHER AREAS

- Access to all repair bays and all shop areas

CRITICAL DIMENSIONS

- 12'-0" vertical clearance to structure and fixtures

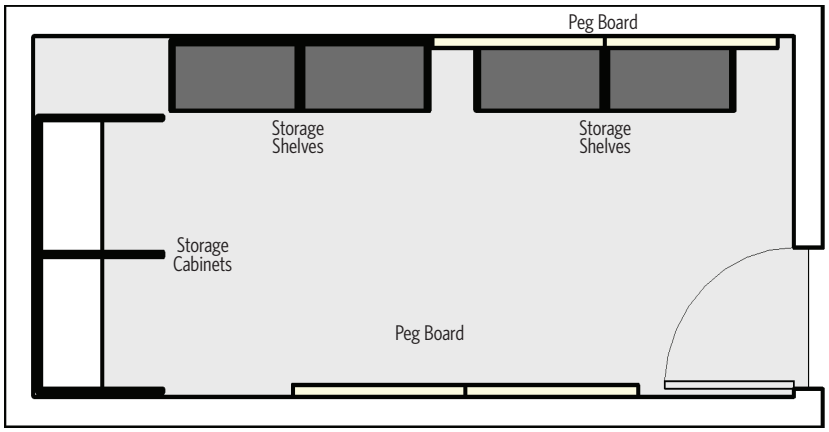
EQUIPMENT/FURNISHINGS

- Toolboxes
- Carts
- Anchors to be installed for security toolboxes
- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

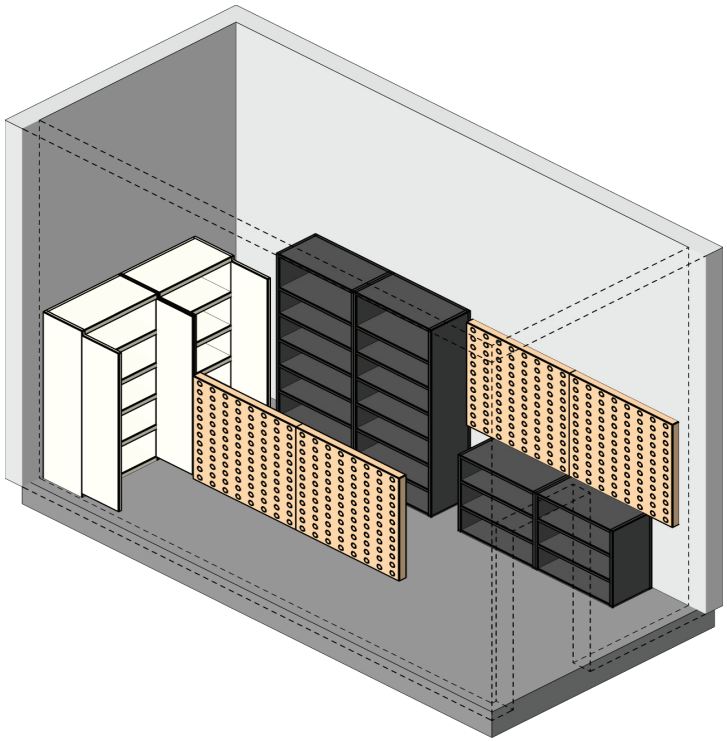
DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Soil, grease, water, slip resistant concrete with integral non-metallic light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish
- Structural:
  - ✓ Control joints in floor slab at adequate spacing
  - ✓ Floor slab to accommodate in-floor radiant heat (if desired)
  - ✓ Structure as needed to support equipment
  - ✓ Floor slab designed to accommodate forklift access
- Mechanical:
  - ✓ In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ As required by equipment
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (20 fc average)
  - ✓ Fixtures located to illuminate work spaces

TOOL STORAGE



GENERIC WALL



FUNCTION

Secure area for storing specialized tools and equipment.

RELATIONSHIP TO OTHER AREAS

- Access to Repair Bays and Shops
- Adjacent to Parts Room and Maintenance Offices

CRITICAL DIMENSIONS

- 12'-0" vertical clearance to structure and fixtures

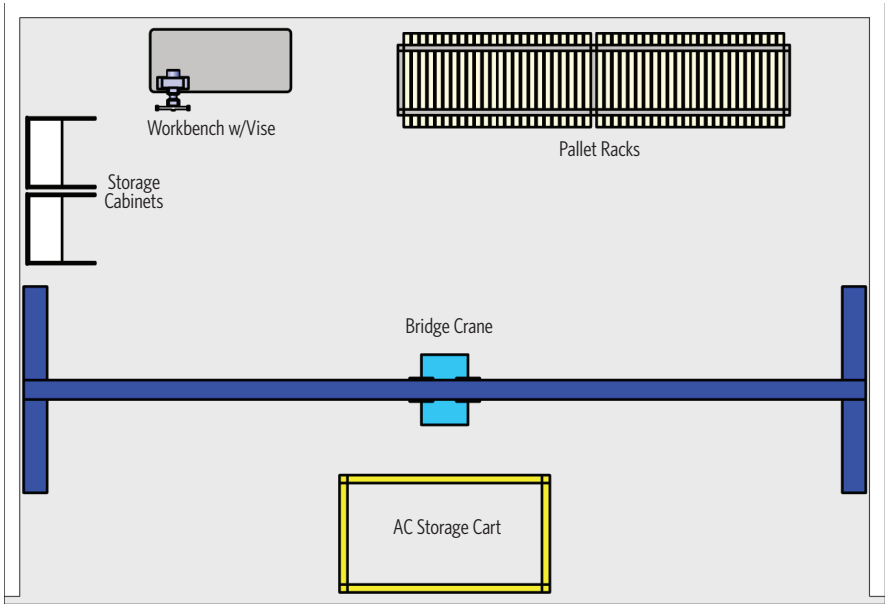
EQUIPMENT/FURNISHINGS

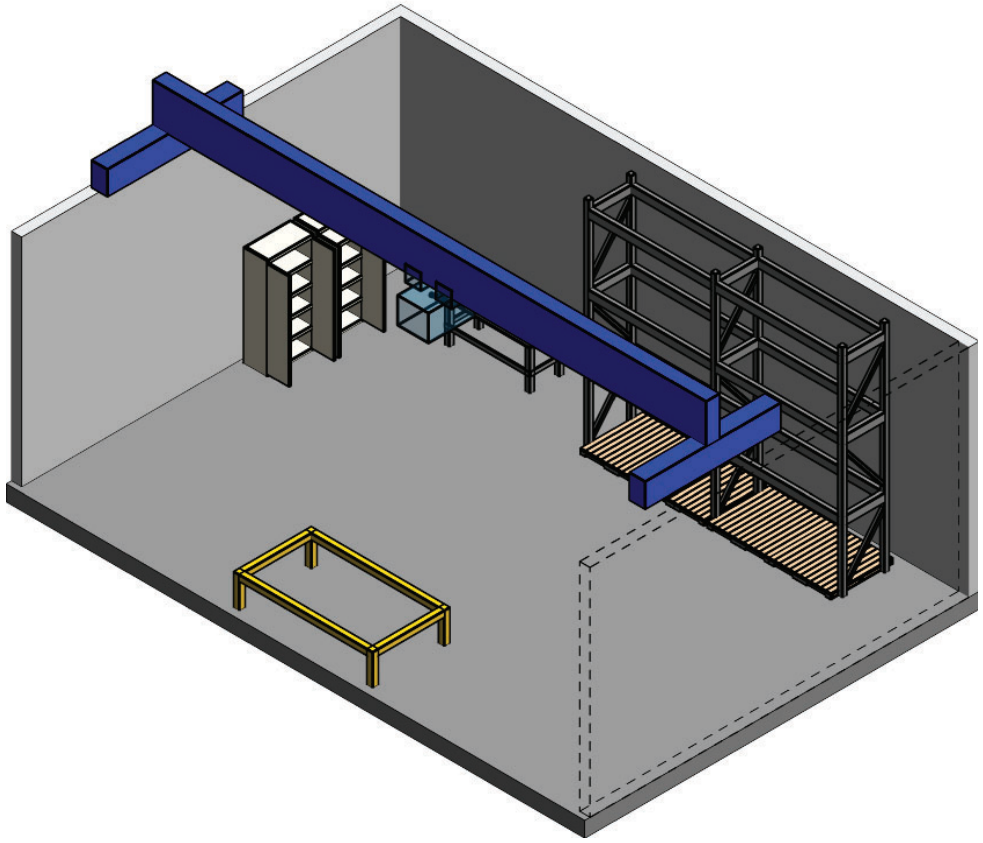
- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Soil, grease, water, slip resistant concrete, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish
  - ✓ Doors: Personnel door with view panels to meet applicable code exit requirements (not required with wire mesh walls)
- Structural:
  - ✓ Control joints in floor slab at adequate spacing
  - ✓ Floor slab to accommodate in-floor radiant heat (if desired)
  - ✓ Structure as needed to support equipment
  - ✓ Floor slab designed to accommodate forklift access
- Mechanical:
  - ✓ In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ As required by equipment
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting: LED lighting in accordance with IES recommendation minimum (20 fc average)

AC SHOP/STORAGE





AC SHOP/STORAGE

FUNCTION

Designated shop for repair and storage of air conditioning units for trolley and future BEBs.

RELATIONSHIP TO OTHER AREAS

- Adjacent to 60' Bus Preventive Maintenance

CRITICAL DIMENSIONS

- 19'-0" vertical clearance to structure and fixtures

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Forklift access
- Physically separated from other areas to prevent migration of noise, dirt and fumes, if possible
- Natural daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access

MECHANICAL CONSIDERATIONS

- In-floor radiant heat (if desired)
- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- As required by equipment

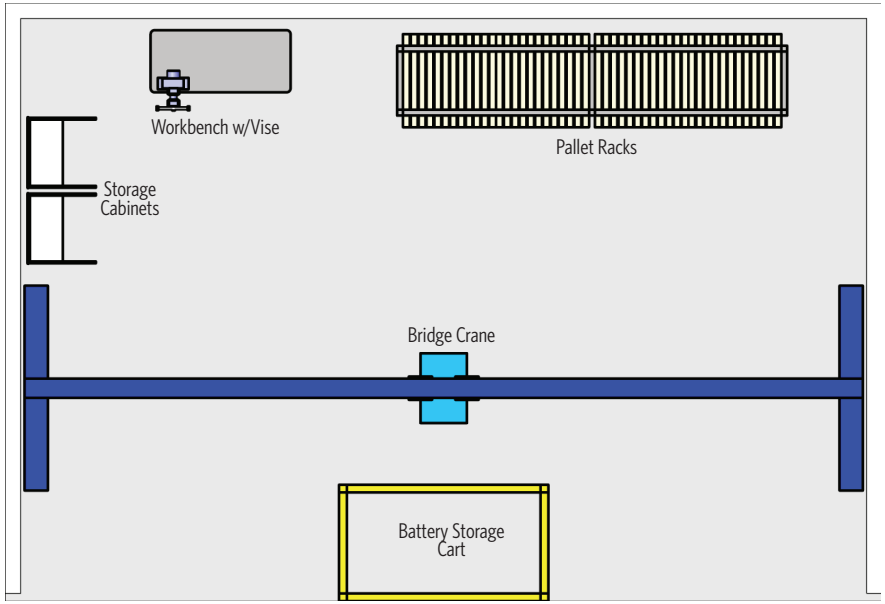
PLUMBING CONSIDERATIONS

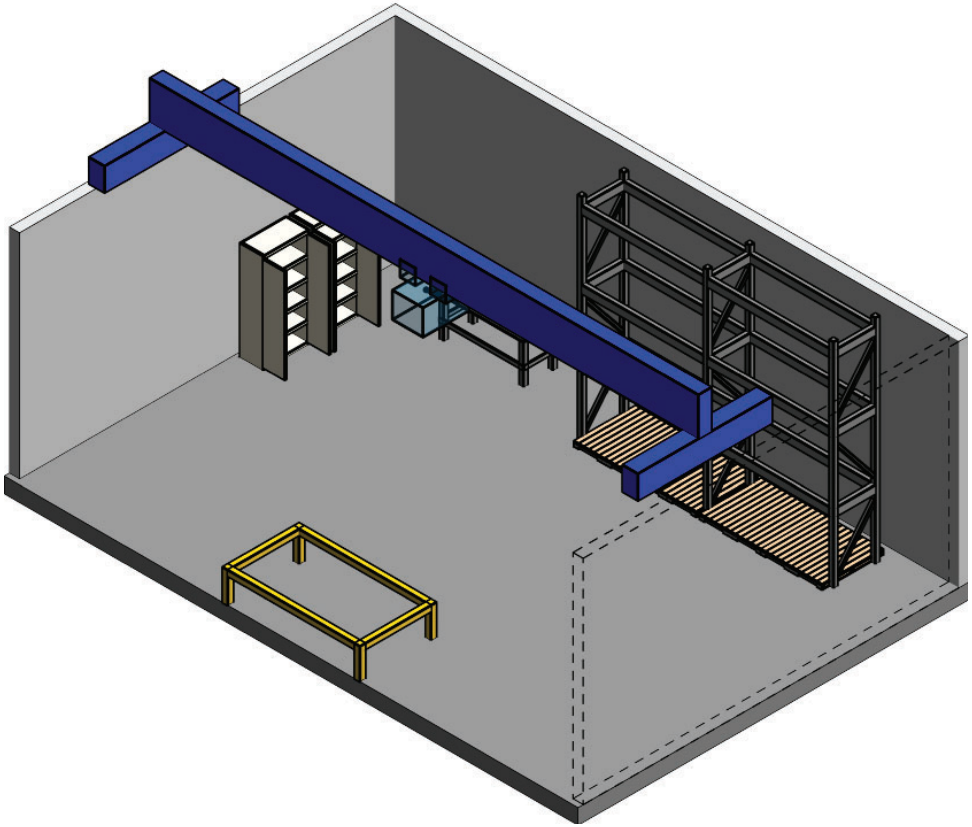
- Compressed air drop:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- Water: 3/4" water hose bibb with standard hose bibb at 2'-0" AFF
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (four minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (50 fc average)
  - ✓ Fixtures located to illuminate work spaces and around the vehicles
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

BATTERY REBUILD SHOP





BATTERY REBUILD SHOP

FUNCTION

Designated shop for the repair and storage of batteries for trolley and future BEBs.

RELATIONSHIP TO OTHER AREAS

- Adjacent to 60' Bus Preventive Maintenance

CRITICAL DIMENSIONS

- 19'-0" vertical clearance to structure and fixtures

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Forklift access
- Physically separated from other areas to prevent migration of noise, dirt and fumes, if possible
- Natural daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access

MECHANICAL CONSIDERATIONS

- In-floor radiant heat (if desired)
- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- As required by equipment

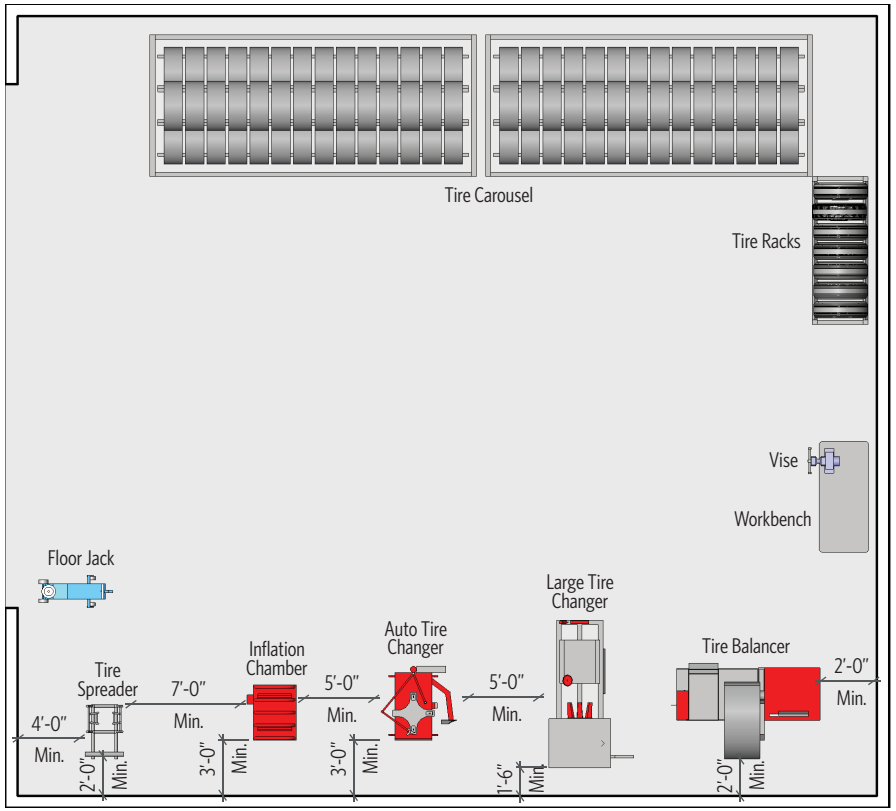
PLUMBING CONSIDERATIONS

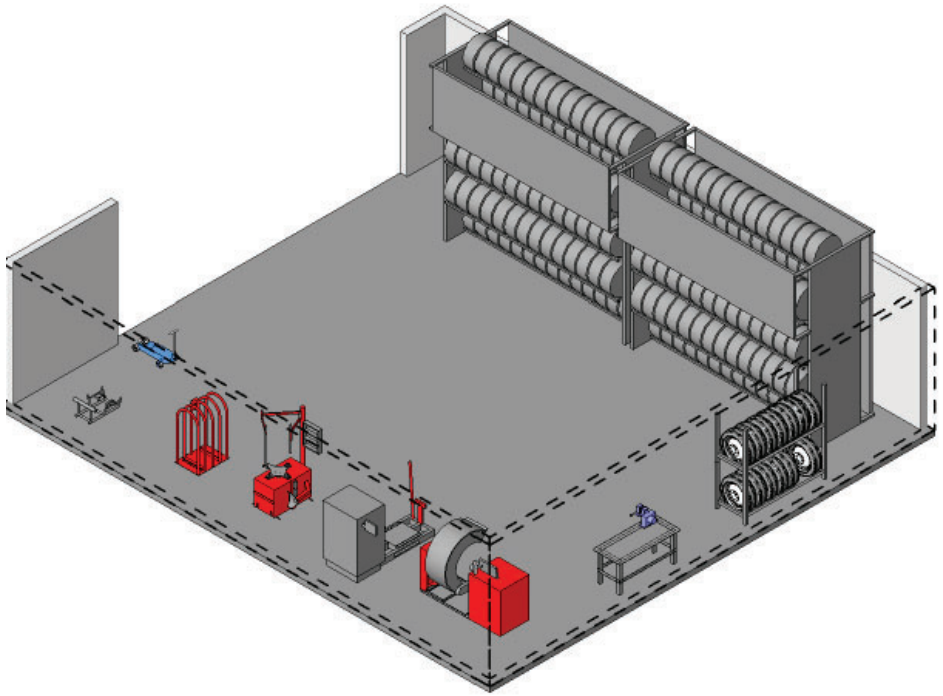
- Compressed air drop:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- Water: 3/4" water hose bibb with standard hose bibb at 2'-0" AFF
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (four minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (50 fc average)
  - ✓ Fixtures located to illuminate work spaces and around the vehicles
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

TIRE SHOP/STORAGE





TIRE SHOP/STORAGE

FUNCTION

Repair, changing, balancing, and storage of tires.

RELATIONSHIP TO OTHER AREAS

- Adjacent to 60 Foot Bus Tire Bay
- Access to Common Work Area and Parts Storage

CRITICAL DIMENSIONS

- 19'-0" vertical clearance to structure and fixtures

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Forklift access
- Access to exterior for delivery of tires
- Physically separated with full height walls from other areas to prevent migration of noise, dirt, and fumes
- Natural daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities, light colored finish

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed for equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access

MECHANICAL CONSIDERATIONS

- In-floor radiant heat (if desired)
- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- As required by equipment

PLUMBING CONSIDERATIONS

- Compressed air:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- As required by equipment

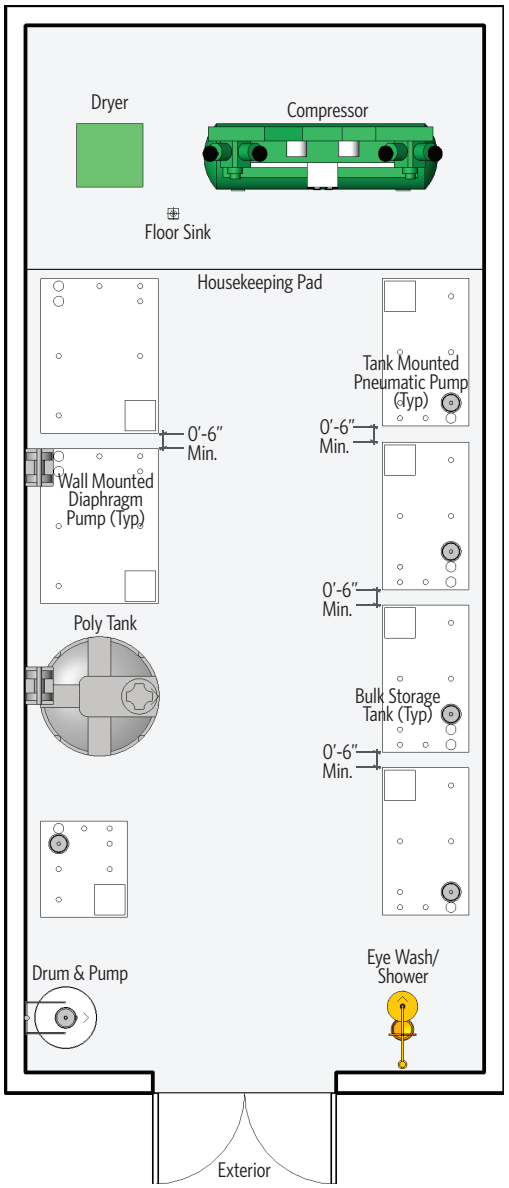
ELECTRICAL CONSIDERATIONS

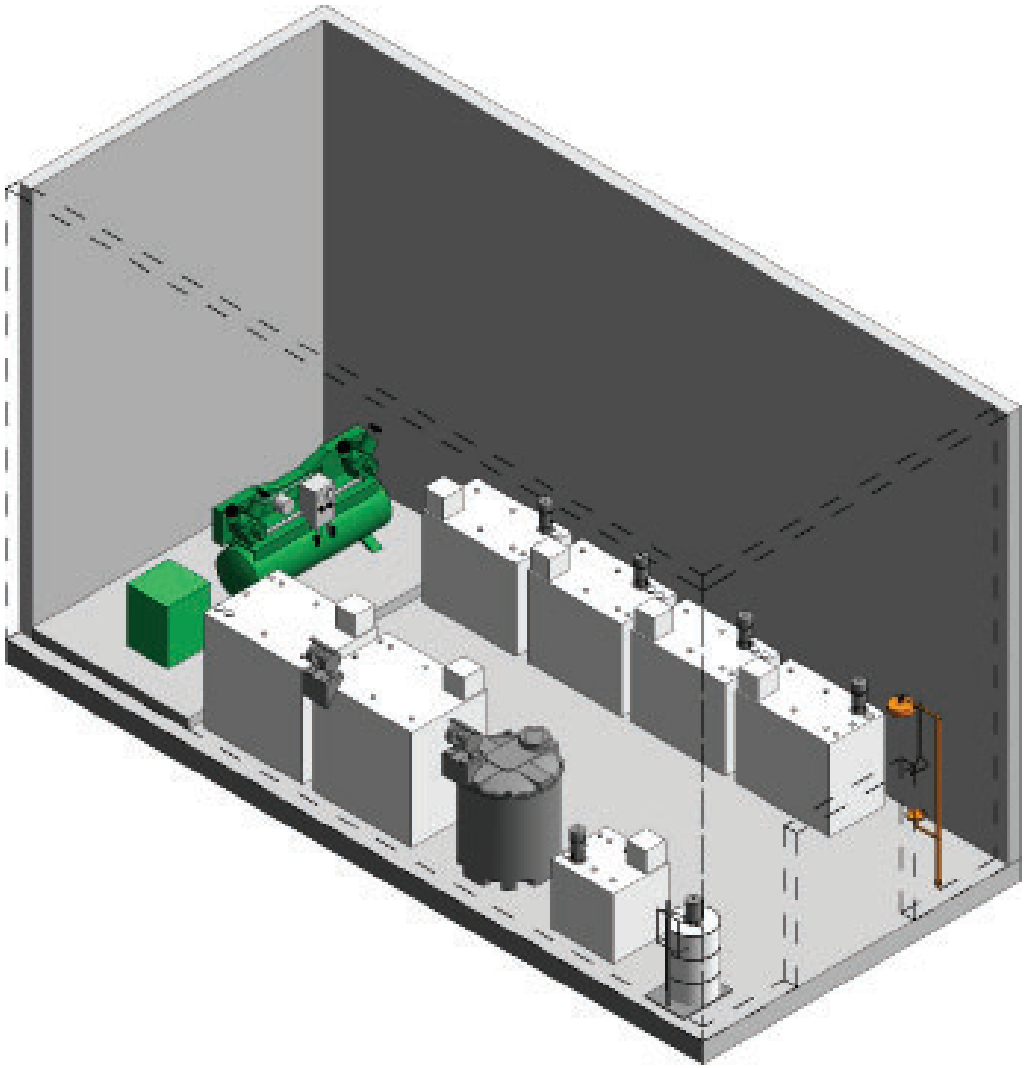
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (five minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum in Storage Area (15 fc average) and Shop Area (25 fc average)
  - ✓ Fixtures located to illuminate work spaces and around the vehicles
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

FIRE SUPPRESSION CONSIDERATIONS

The fire protection and pyrotechnics experts on the detailed design team will be responsible for devising a robust fire protection system for the tire bay and tire shop/storage areas that minimizes risk to the Yard and any joint development above. Review and recommendations by these experts will include, but not be limited to, the location, ventilation, and fire suppression systems for Potrero Yard's tire facilities.

LUBE/COMPRESSOR ROOM





LUBE/COMPRESSOR ROOM

FUNCTION

Enclosed room for storage and central distribution of lubricants. Space shall include a compressor(s) and refrigerated air dryer(s).

RELATIONSHIP TO OTHER AREAS

- Access to exterior for deliveries

CRITICAL DIMENSIONS

- 12'-0" vertical clearance to structure and fixtures

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Exterior access for deliveries
- Acoustically and physically separated from other areas to prevent migration of noise, dirt, and fumes

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finish sound absorption material
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities, with light colored finish, and sound absorption material
- Doors:
  - ✓ Personnel door with view panel to meet applicable code exit requirements
  - ✓ Double 6'-0" wide door with interior exit device
  - ✓ No thresholds
- Acoustics: Determine based on equipment and location of adjacent spaces

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- 0'-6" housekeeping pad for both the air compressor and refrigerated air dryer
- Structure as needed to support equipment
- Containment pit for 110 percent of largest tank (per local code)

MECHANICAL CONSIDERATIONS

- Heating set point: 55 degrees Fahrenheit
- Exhaust: Minimum 1.0 CFM per square foot
- Negative pressurization
- As required by equipment

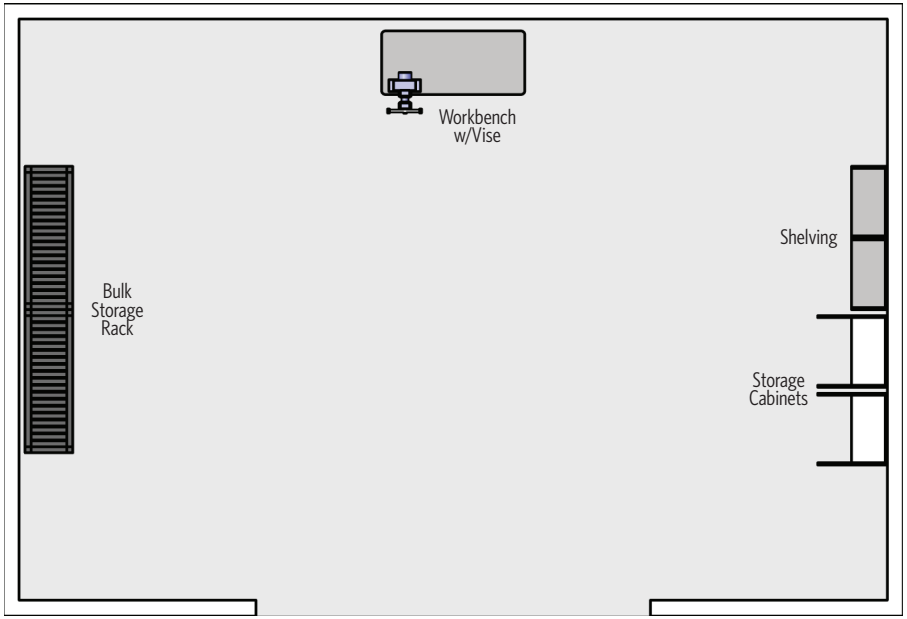
PLUMBING CONSIDERATIONS

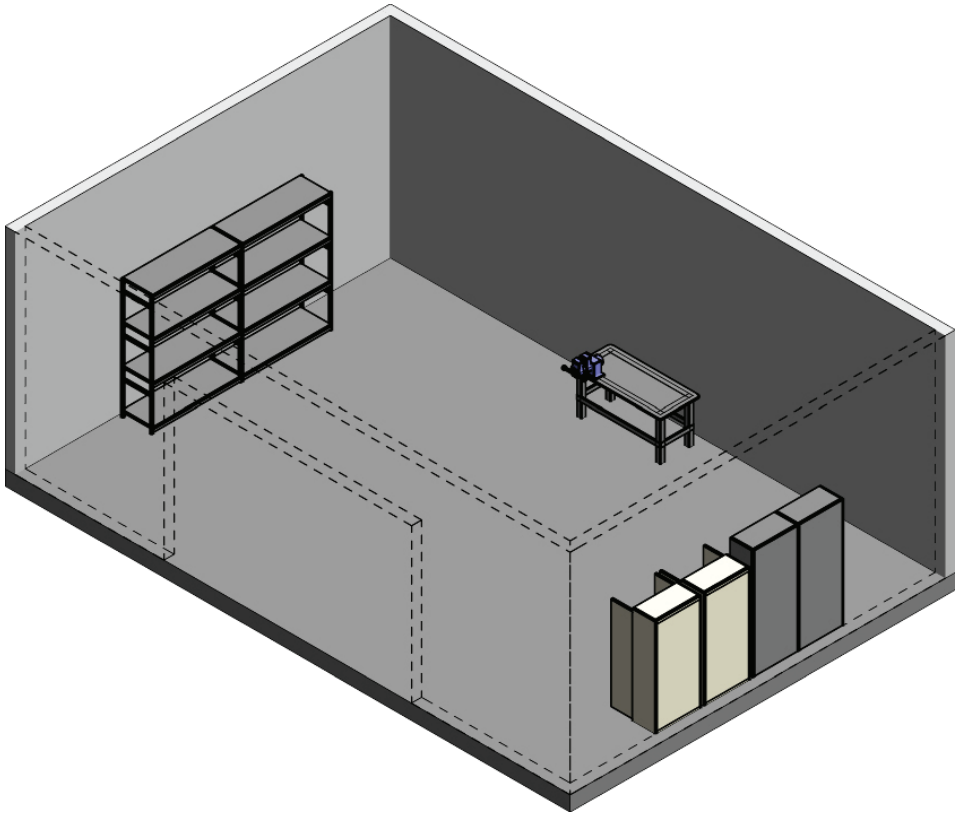
- Compressed air:
  - ✓ Duplex air compressor, air dryer, and air receiver
  - ✓ Floor sink between air compressor and dryer. Plumb to central sediment and oil interceptor
  - ✓ 2'-0" compressed air piping loop (minimum) started in the Lube/Compressor Room
  - ✓ Compressed air line with 3/8" and 1/2" shut-off valve, separator, regulator with gauge, lubricator, and quick disconnect on wall at 4'-0" AFF
  - ✓ Connect to lubricant pumps
- Tank mount all piston lubricant pump(s)
- Wall mount all diaphragm pump(s)
- CG pump mounted to an air operated hoist (if required)
- Plumb tanks to corresponding lube reel banks located in the Repair Bays
- Plumb UC tanks to corresponding pumps located in the Repair Bays (if required)
- 3/4" water hose bibb with standard faucet 2'-0" AFF
- Emergency eyewash

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (four minimum) on walls
  - ✓ Lube/compressor: 25 fc average
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (25 fc average)
  - ✓ Fixtures located to illuminate work spaces

MINOR BODY SHOP





MINOR BODY SHOP

FUNCTION

Designated shop for minor body repair or replacement and storage.

RELATIONSHIP TO OTHER AREAS

- Open to Minor Body Bay

CRITICAL DIMENSIONS

- 12'-0" vertical clearance to structure and fixtures

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Forklift access
- Physically separated from other areas to prevent migration of noise, dirt and fumes, if possible
- Natural daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access

MECHANICAL CONSIDERATIONS

- In-floor radiant heat (if desired)
- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- Exhaust and makeup air for dust collection system
- As required by equipment

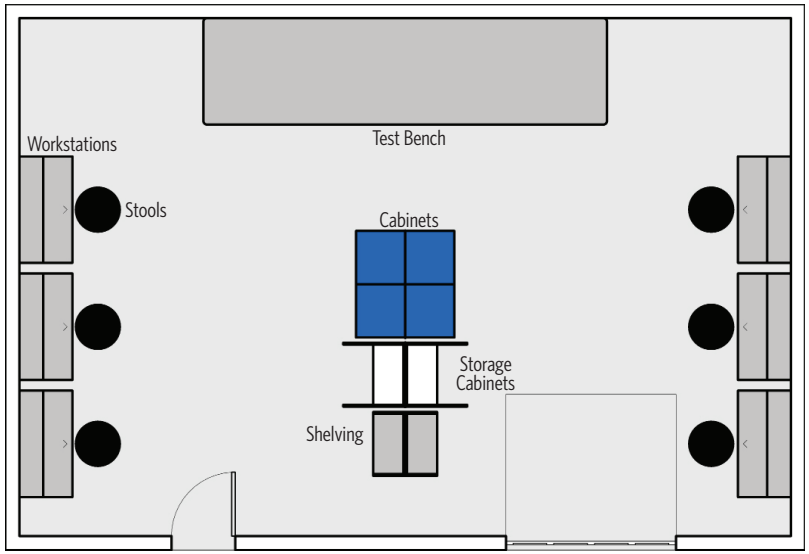
PLUMBING CONSIDERATIONS

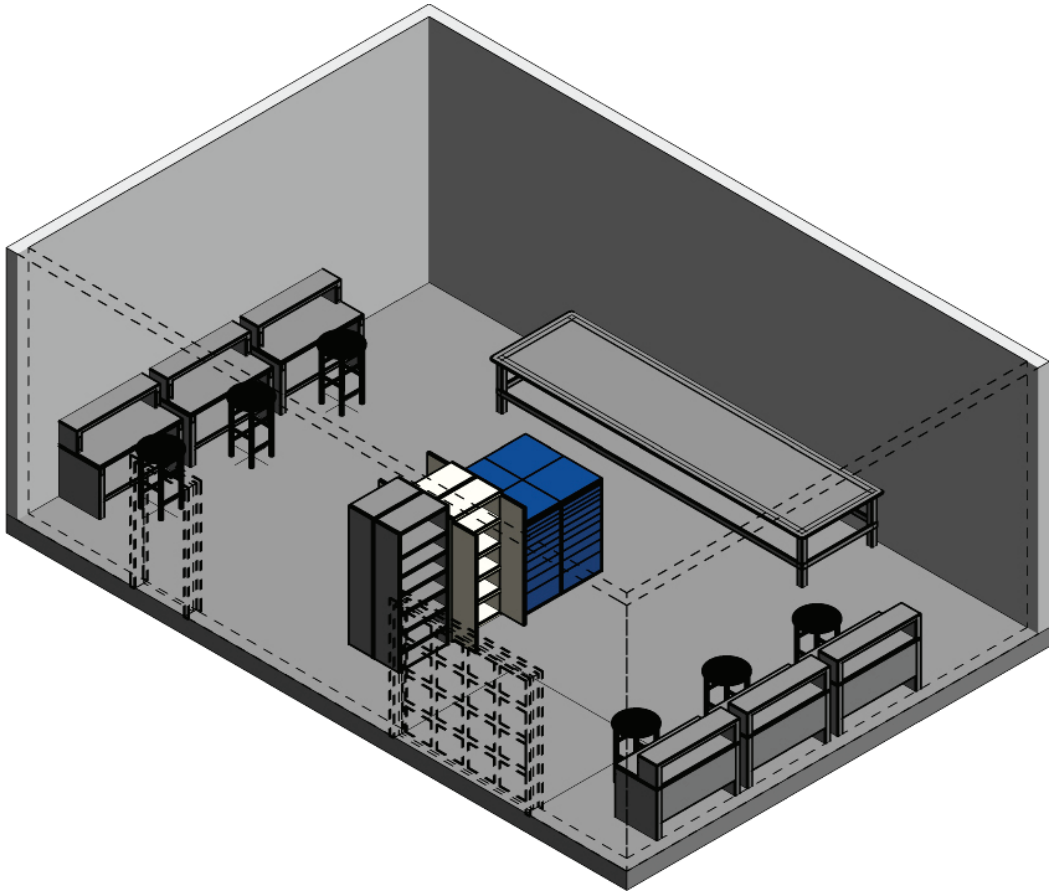
- Compressed air drop:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- Water: 3/4" water hose bibb with standard hose bibb at 2'-0" AFF
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (50 fc average)
  - ✓ Fixtures located to illuminate work spaces and around the vehicles
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (four minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

ELECTRONIC BENCH SHOP





ELECTRONIC BENCH SHOP

FUNCTION

Enclosed area for repairing and modifying trolleys and future BEBs electronic and computer control systems. Radio equipment, electrical signage, and other electrical equipment is installed and maintained in this space.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Electronic Shop Workstations

CRITICAL DIMENSIONS

- 12'-0" vertical clearance to structure and fixtures

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Dust proof required for electrical components

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities, light colored finish
- Doors:
  - ✓ Personnel doors with view panels to meet applicable code exit requirements
  - ✓ Overhead door (if desired): High-lifting sectional, steel, insulated, 10'-0" by 10'-0" with view panels, automatic operator, interior and exterior push button controls

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)

MECHANICAL CONSIDERATIONS

- In-floor radiant heat (if desired)
- Cooling set point: 74 degrees Fahrenheit
- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- As required by equipment
- Relative humidity: 50-35 percent

PLUMBING CONSIDERATIONS

- Compressed air drop:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (four minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (50 fc average)
  - ✓ Fixtures located to illuminate work spaces
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

SECTION 5.4: FARE BOX AND CLIPPER CARD READER REPAIR SHOP

GENERAL OFFICE MODULES: OFFICE AREAS

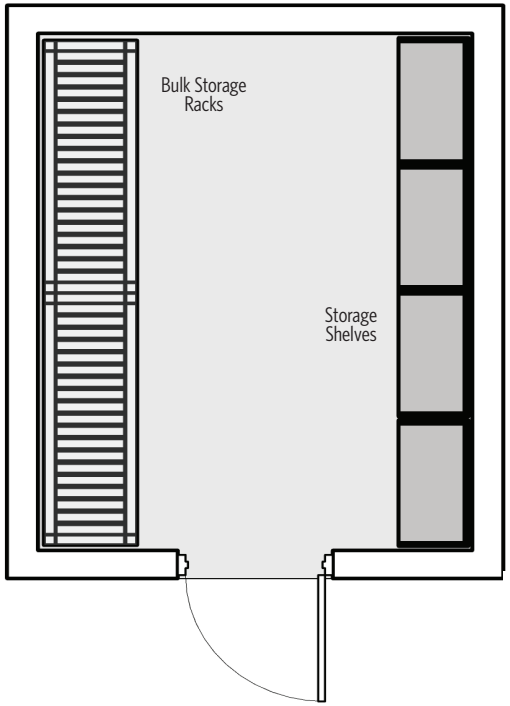
MANAGER

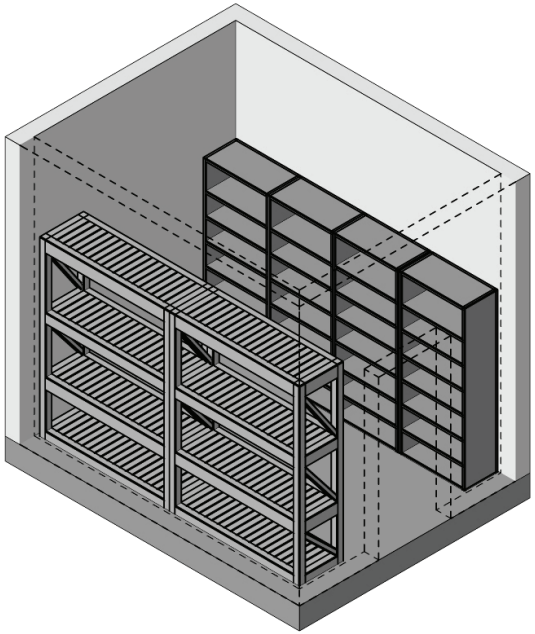
- Reference **Office Module Private Office- 120 sf**
- Adjacent to Fare Box Staff

FARE BOX STAFF

- Reference **Office Module Workstation- 64 sf**
- Adjacent to Manager
- Adjacent to Shop, Storage, and Parts Storage

INCOMING AND OUTGOING DEVICE STORAGE





FUNCTION

Storage of the fare box and clipper card readers when needing repair and repair is completed.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Fare Box Staff

CRITICAL DIMENSIONS

- 12’-0” vertical clearance to structure and fixtures

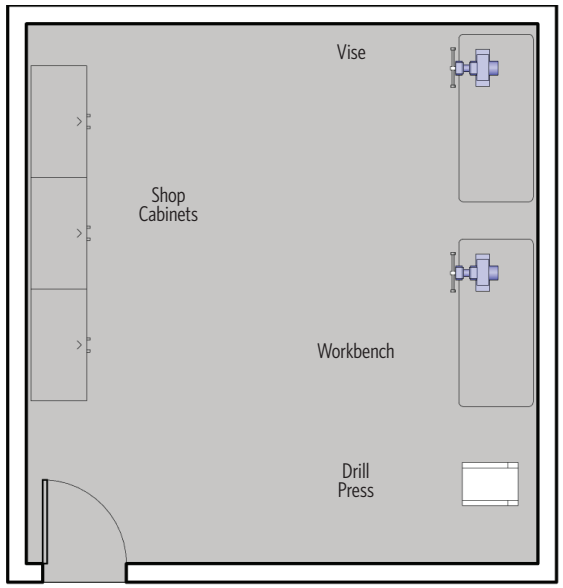
EQUIPMENT/FURNISHINGS

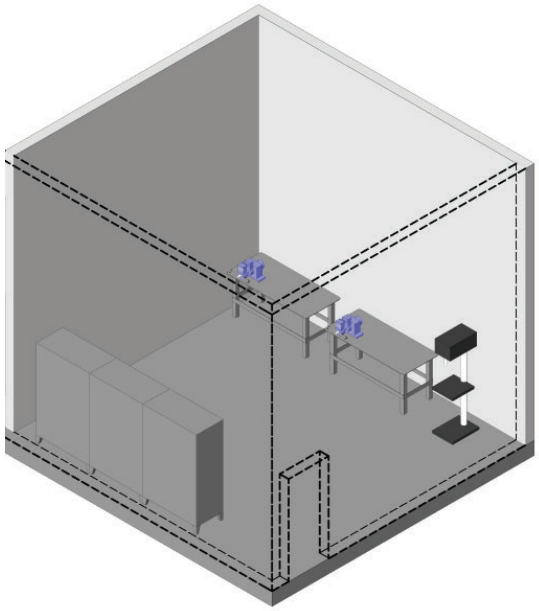
- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Soil, grease, water, slip resistant concrete, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish
  - ✓ Doors: Personnel door with view panels to meet applicable code exit requirements (not required with wire mesh walls)
- Structural:
  - ✓ Control joints in floor slab at adequate spacing
  - ✓ Floor slab to accommodate in-floor radiant heat (if desired)
  - ✓ Structure as needed to support equipment
  - ✓ Floor slab designed to accommodate forklift access
- Mechanical:
  - ✓ In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ As required by equipment
- Power:
  - ✓ All receptacles and outlets at 3’-6” AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting: LED lighting in accordance with IES recommendation minimum (20 fc average)

SHOP





FUNCTION

Designated shop for repair of fare boxes and clipper readers.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Fare Box Staff, Storage, and Parts Storage

CRITICAL DIMENSIONS

- 12’-0” vertical clearance to structure and fixtures

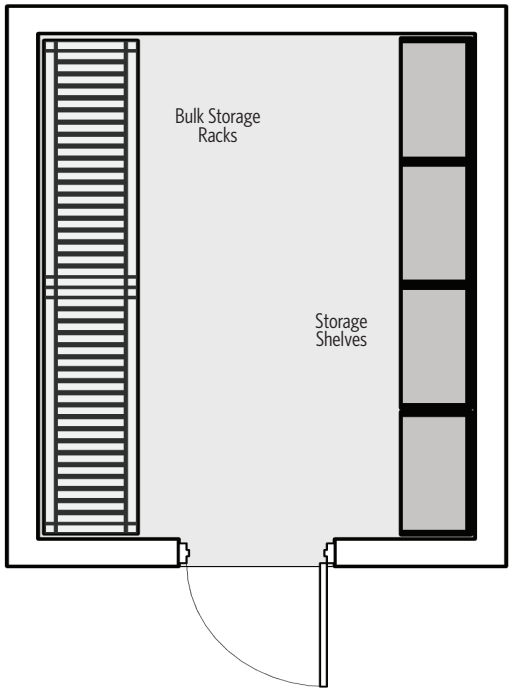
EQUIPMENT/FURNISHINGS

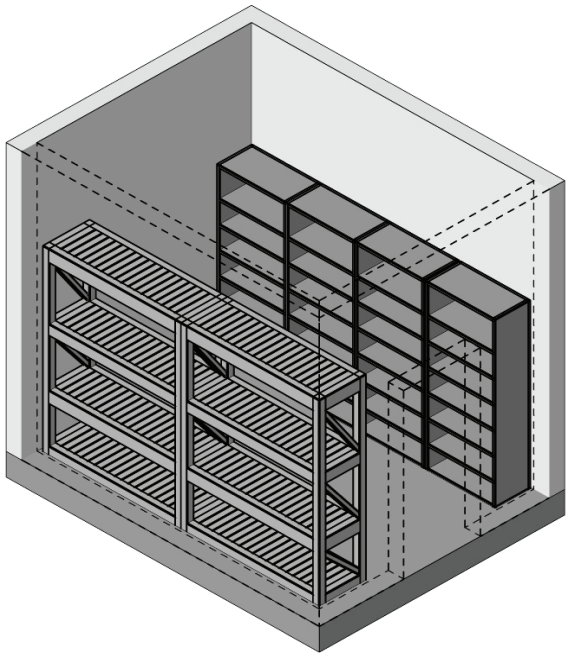
- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Soil, grease, water, slip resistant concrete, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish
  - ✓ Doors: Personnel door with view panels to meet applicable code exit requirements (not required with wire mesh walls)
- Structural:
  - ✓ Control joints in floor slab at adequate spacing
  - ✓ Floor slab to accommodate in-floor radiant heat (if desired)
  - ✓ Structure as needed to support equipment
  - ✓ Floor slab designed to accommodate forklift access
- Mechanical:
  - ✓ In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ As required by equipment
- Power:
  - ✓ All receptacles and outlets at 3’-6” AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting: LED lighting in accordance with IES recommendation minimum (20 fc average)

STORAGE





FUNCTION

Dedicated secure storage for fare box and clipper reader supplies.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Shop and Parts Storage

CRITICAL DIMENSIONS

- 12’-0” vertical clearance to structure and fixtures

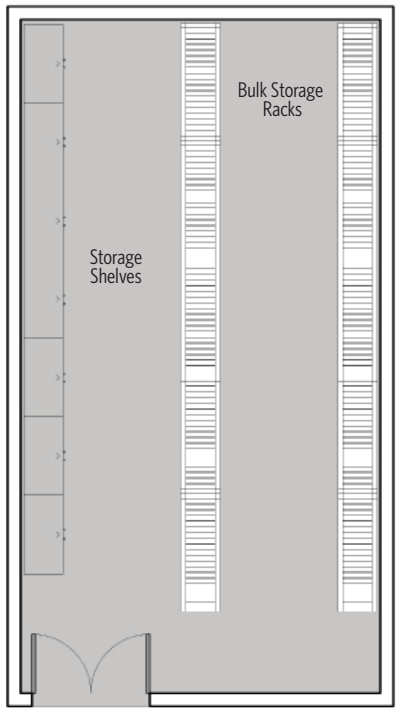
EQUIPMENT/FURNISHINGS

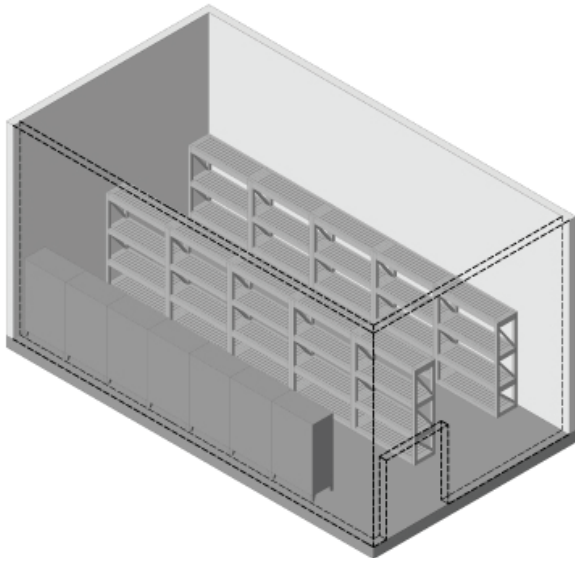
- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Soil, grease, water, slip resistant concrete, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish
  - ✓ Doors: Personnel door with view panels to meet applicable code exit requirements (not required with wire mesh walls)
- Structural:
  - ✓ Control joints in floor slab at adequate spacing
  - ✓ Floor slab to accommodate in-floor radiant heat (if desired)
  - ✓ Structure as needed to support equipment
  - ✓ Floor slab designed to accommodate forklift access
- Mechanical:
  - ✓ In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ As required by equipment
- Power:
  - ✓ All receptacles and outlets at 3’-6” AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting: LED lighting in accordance with IES recommendation minimum (20 fc average)

PARTS STORAGE





FUNCTION

Dedicated storage for fare box and clipper reader components.

RELATIONSHIP TO OTHER AREAS

- N/A

CRITICAL DIMENSIONS

- 12’-0” vertical clearance to structure and fixtures

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Soil, grease, water, slip resistant concrete, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish
  - ✓ Doors: Personnel door with view panels to meet applicable code exit requirements (not required with wire mesh walls)
- Structural:
  - ✓ Control joints in floor slab at adequate spacing
  - ✓ Floor slab to accommodate in-floor radiant heat (if desired)
  - ✓ Structure as needed to support equipment
  - ✓ Floor slab designed to accommodate forklift access
- Mechanical:
  - ✓ In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ As required by equipment
- Power:
  - ✓ All receptacles and outlets at 3’-6” AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting: LED lighting in accordance with IES recommendation minimum (20 fc average)

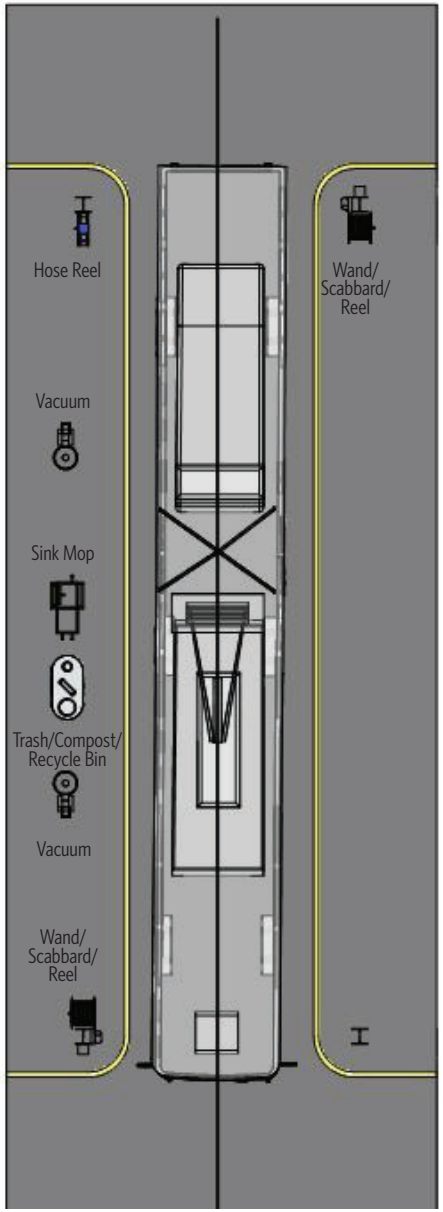
SECTION 5.5: SERVICE AND CLEAN

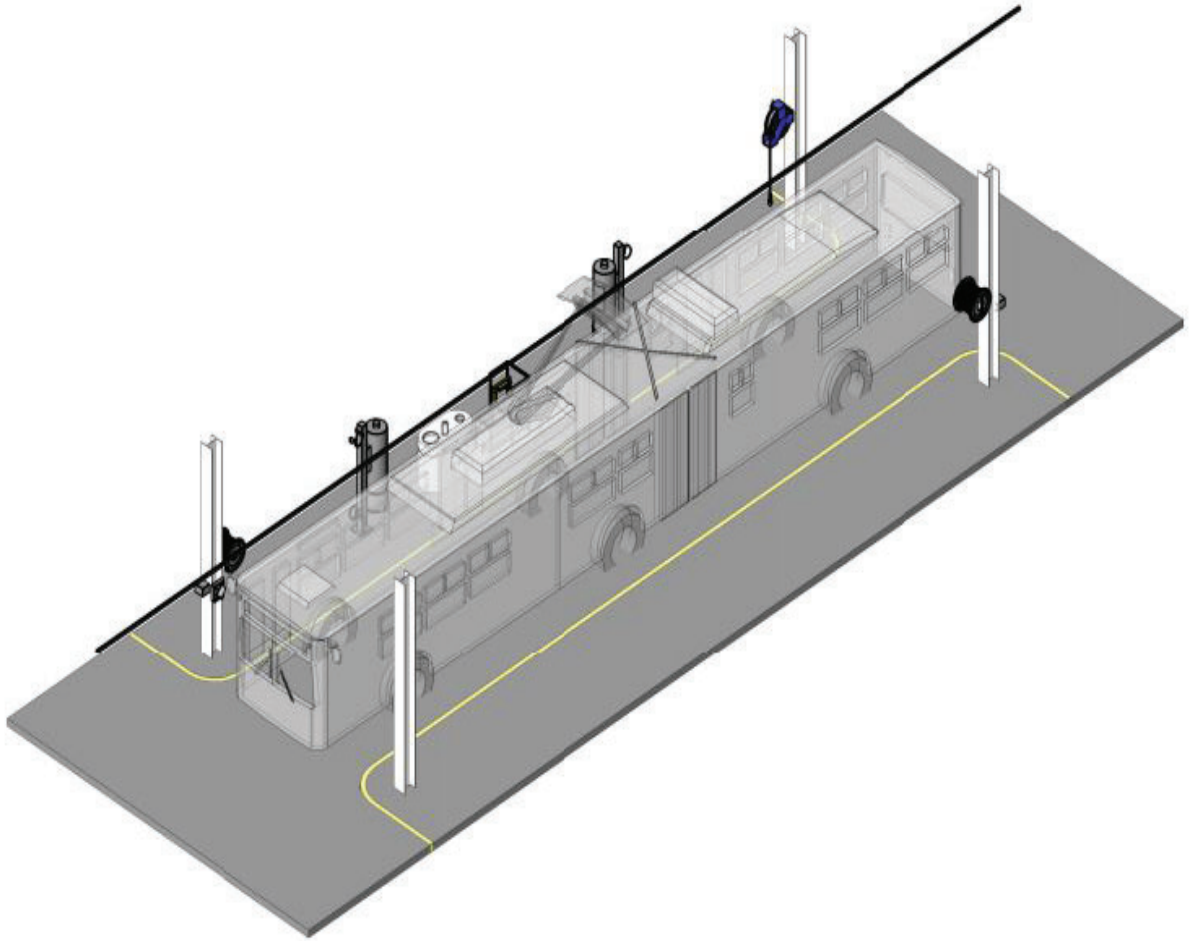
GENERAL OFFICE MODULE: OFFICE AREAS

SERVICE SUPERVISOR OFFICE

- Reference **Office Module Shared Office**
- Adjacent to Service Position and Bus Washer

SERVICE POSITION





SERVICE POSITION

FUNCTION

Dedicated bay used for nightly servicing, fluid level checks, and tire pressure checks. The space also serves as detail bay cleaning position (when needed).

RELATIONSHIP TO OTHER AREAS

- Adjacent to Cleaning Equipment Storage

CRITICAL DIMENSIONS

- 16'-0" vertical clearance
- 20'-0" wide by 70'-0" long
- 8'-0" island
- 12'-0" lane

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment
- Wand
- Scabbard
- Trash/Compost/Recycle bin
- OCS overhead
- Electric charging: Reference E-Bus Performance Requirements. This E-Bus Performance Requirements Document supersedes anything in this document.

DESIGN FEATURES

- Natural daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes
  - ✓ Floor: Soil, grease, water, slip resistant concrete, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities, light colored finish
- Doors: None

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment

MECHANICAL CONSIDERATIONS

- As required by equipment
- 1.0 CFM per square foot continuous exhaust in accordance with NFPA 30A
- Heating set point: 65 degrees Fahrenheit
- In-floor radiant heat (if desired)

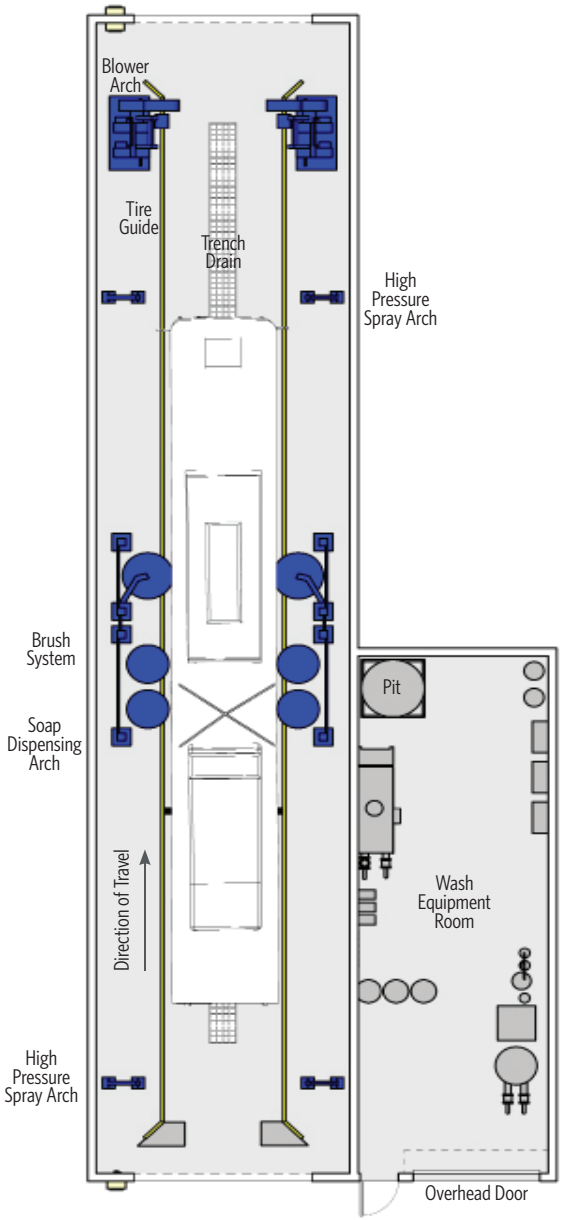
PLUMBING CONSIDERATIONS

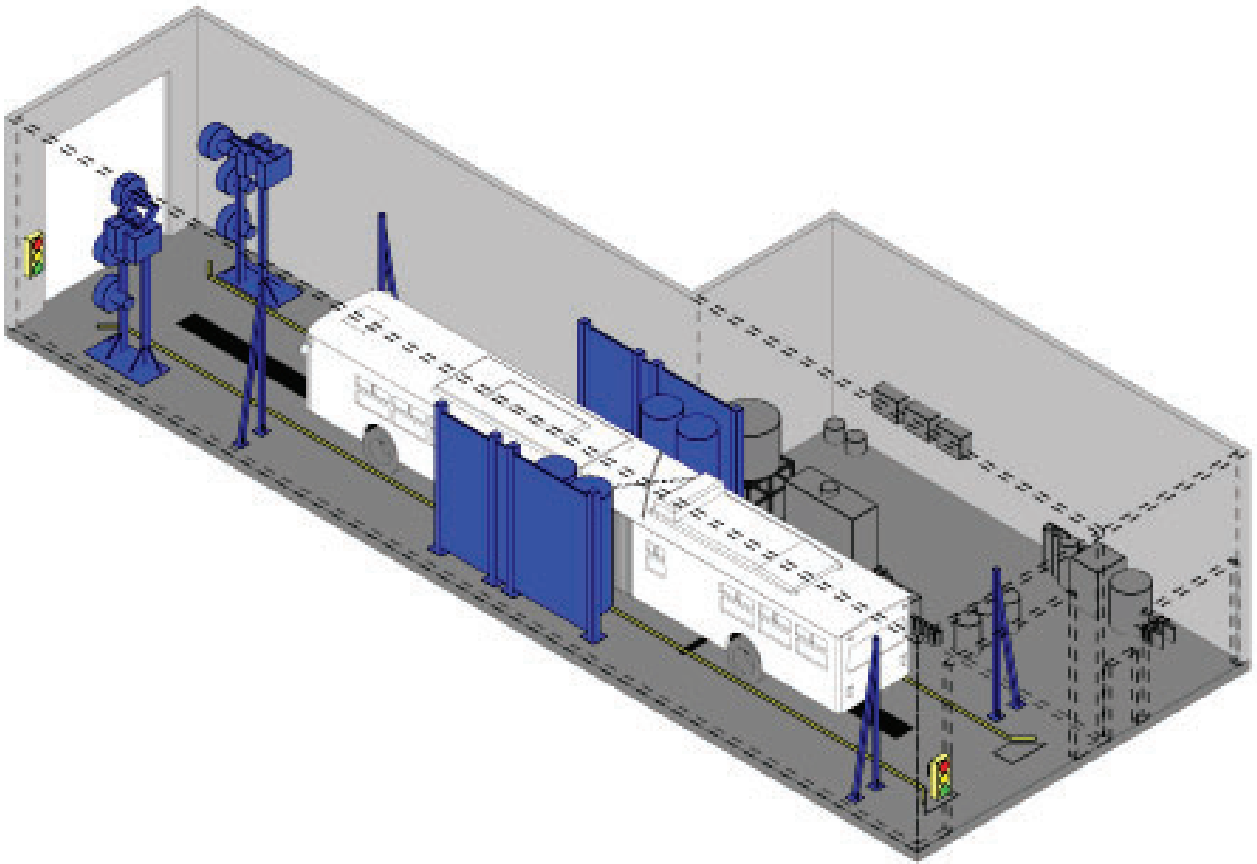
- 3/4" hot water hose bib with standard faucet, 2'-0" AFF (one per mop sink)
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets mounted at 3'-6" AFF and water protected
  - ✓ Provide general purpose duplex receptacles (four minimum) on walls, columns, and between overhead doors
  - ✓ Dedicated computer receptacle, adjacent to data conduit on column adjacent to workbench
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (20 fc average)
  - ✓ Fixtures located to illuminate work spaces and around the vehicles
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns at each lane/fuel position

BUS WASHER/WATER RECLAMATION





BUS WASHER/WATER RECLAMATION

FUNCTION

Dedicated area for automatic washing of sides, top, front, back, and under carriage of the trolleys, motors coaches, and future BEBs.

RELATIONSHIP TO OTHER AREAS

- Access to Service Position

CRITICAL DIMENSIONS

- 18'-0" vertical clearance to structure (minimum)
- 20'-0" wide by 100'-0" long

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment
- Drive through wash system
- Water reclamation system
- No OCS

DESIGN FEATURES

- Forklift accessible
- Natural daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, cast-in-place concrete or CMU block, light colored finish, with polyurea coating treatment for wet and moisture protection
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish
- Doors:
  - ✓ Personnel doors with view panels to meet applicable code exit requirements (Equipment Room)
  - ✓ Equipment Room overhead door, 10'-0" by 12'-0"
- Bollards on exterior jambs of overhead door (two each)

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structural grating over sump pit to accommodate H-20 loading
- Slope floor to trench drain and sump pit
- Structure as needed to support equipment
- Control joints to have metal water stops
- Wash Bay:
  - ✓ Integrated trench drain and sump pit with removable covers
  - ✓ Trench drain with removable cover at overhead door(s)
  - ✓ Wash Equipment Room: sump pits with removable covers

MECHANICAL CONSIDERATIONS

- Special ventilation to remove moisture, low air supply to eliminate steam
- Water resistant heating system
- As required by equipment
- Exhaust:
  - ✓ Minimum 10 air changes per hour when wash equipment is activated
  - ✓ Minimum one air change per hour when wash equipment is inactive
- Heating set point: 55 degrees Fahrenheit

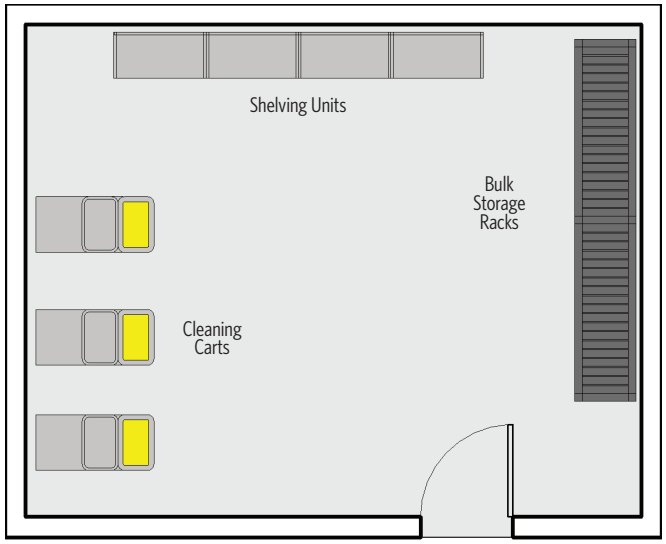
PLUMBING CONSIDERATIONS

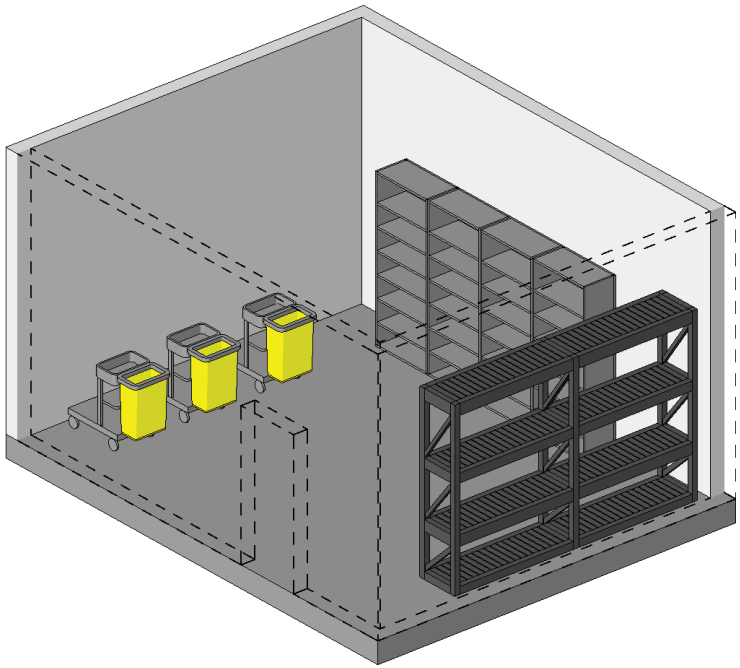
- Trench drains:
  - ✓ Integrated trench drain sump pit with removable covers to central sediment and oil interceptor
  - ✓ Trench drain with removable cover at overhead door, with sediment basket upstream of trap.
  - ✓ Wash Equipment Room: sump with removable covers at an overflow to sediment and oil interceptor
- Water and compressed air connections to wash and reclamation equipment
- Emergency eyewash in Wash Equipment Room
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets mounted at 3'-6" AFF and water protected
  - ✓ Provide waterproof duplex receptacles (four minimum) on walls
  - ✓ All outlets and electrical boxes sealed for a hose down environment
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in Bay (50 fc average) and in Water Reclamation Room (25 fc average)
  - ✓ Fixtures located to illuminate work spaces and around vehicles
- Communications: Paging/intercom system speakers

CLEANING EQUIPMENT STORAGE





FUNCTION

Secure room for storage of vehicle cleaning equipment.

RELATIONSHIP TO OTHER AREAS

- Adjacent to service position

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: finished concrete (recommended)
  - ✓ Walls: Soil and grease resilient, with light color finish
  - ✓ Ceiling: Painted exposed structure
  - ✓ Doors:
    - Personnel door with view panels to meet applicable code exit requirements.
    - Electronically secured entry (as required)
- Mechanical: Provide appropriate balanced cooling, heating, and ventilation (per code)
- Power:
  - ✓ LED lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensors

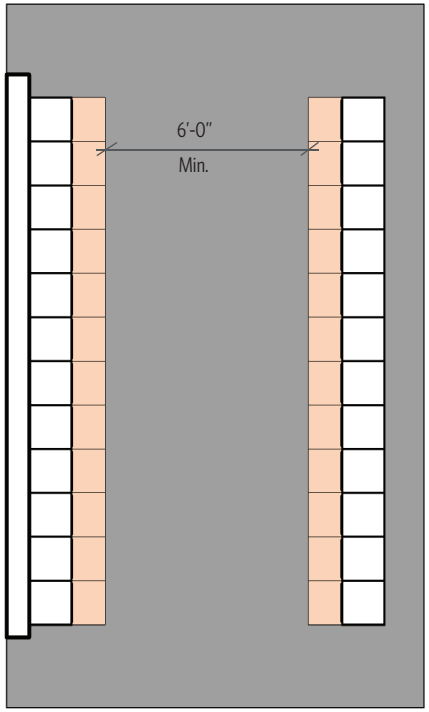
SECTION 5.6: PARTS

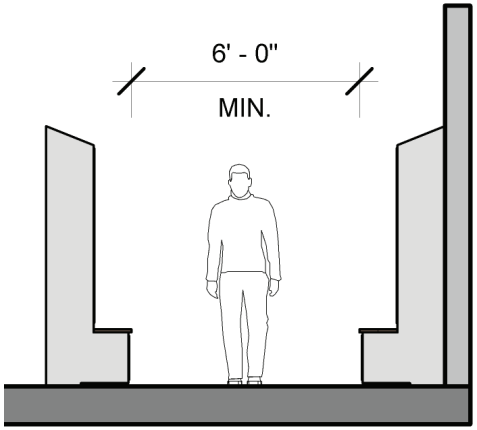
GENERAL MODULE: OFFICE AREAS

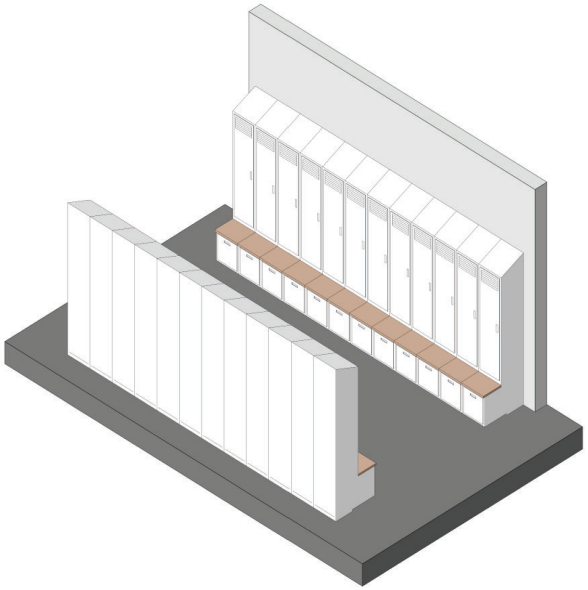
PARTS SUPERVISOR

- Reference **Office Module Private Office - 120 sf**
- Adjacent to Parts Storage
- Adjacent to Shopkeepers

PARTS LOCKERS







PARTS

Locker area for each Parts employees. Locker areas must be appropriately sized to meet the needs of Parts staff.

RELATIONSHIP TO OTHER AREAS

- Located within Parts Room

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

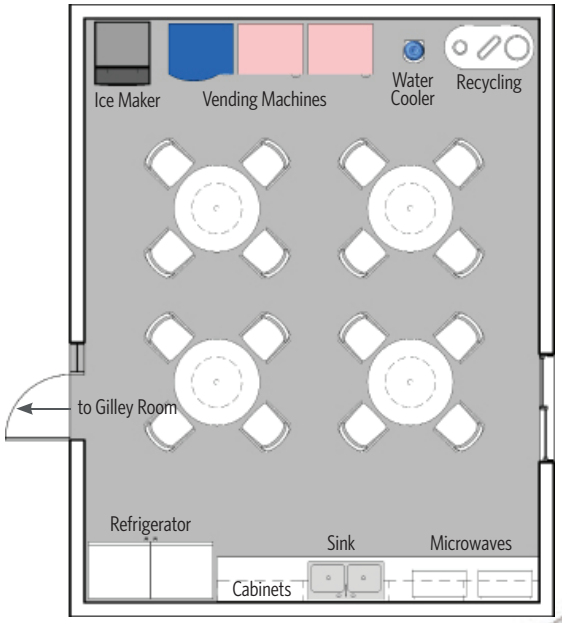
EQUIPMENT/FURNISHINGS

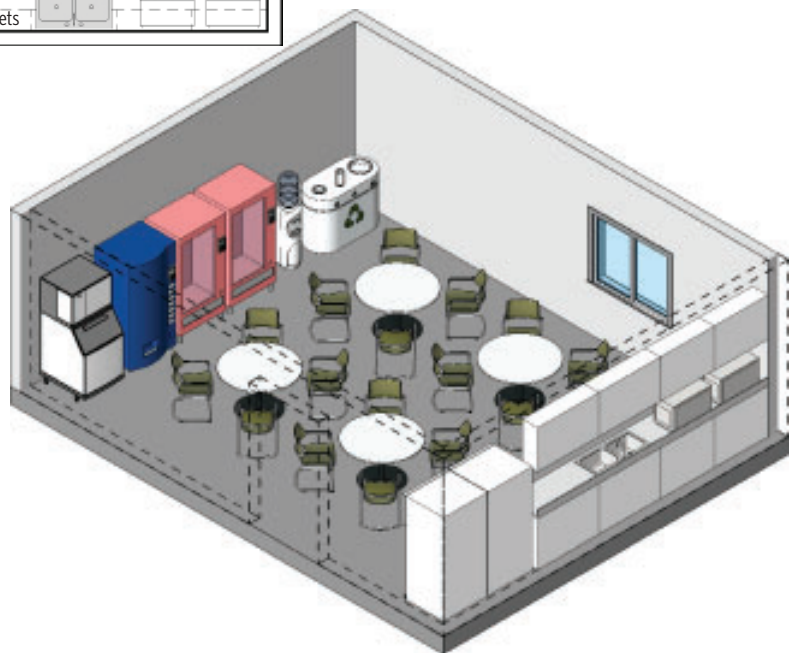
- 6'-0" high gear, well-ventilated lockers with built-in bench
- Lockers must be ADA compliant and have mirrors
- Locker Dimensions: 24" by 24"
- Lockers to have sloped tops

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering or finished concrete (recommended)
  - ✓ Walls:
    - Tile covering or finished masonry
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors: Single leaf 3'-0" door
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating, ventilation, and exhaust (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (15 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

BREAK ROOM





FUNCTION

Area used for staff to eat, prepare, and store food.

RELATIONSHIP TO OTHER AREAS

- Located within Parts Room.

CRITICAL DIMENSIONS

- 9' -0" vertical clearance (minimum)

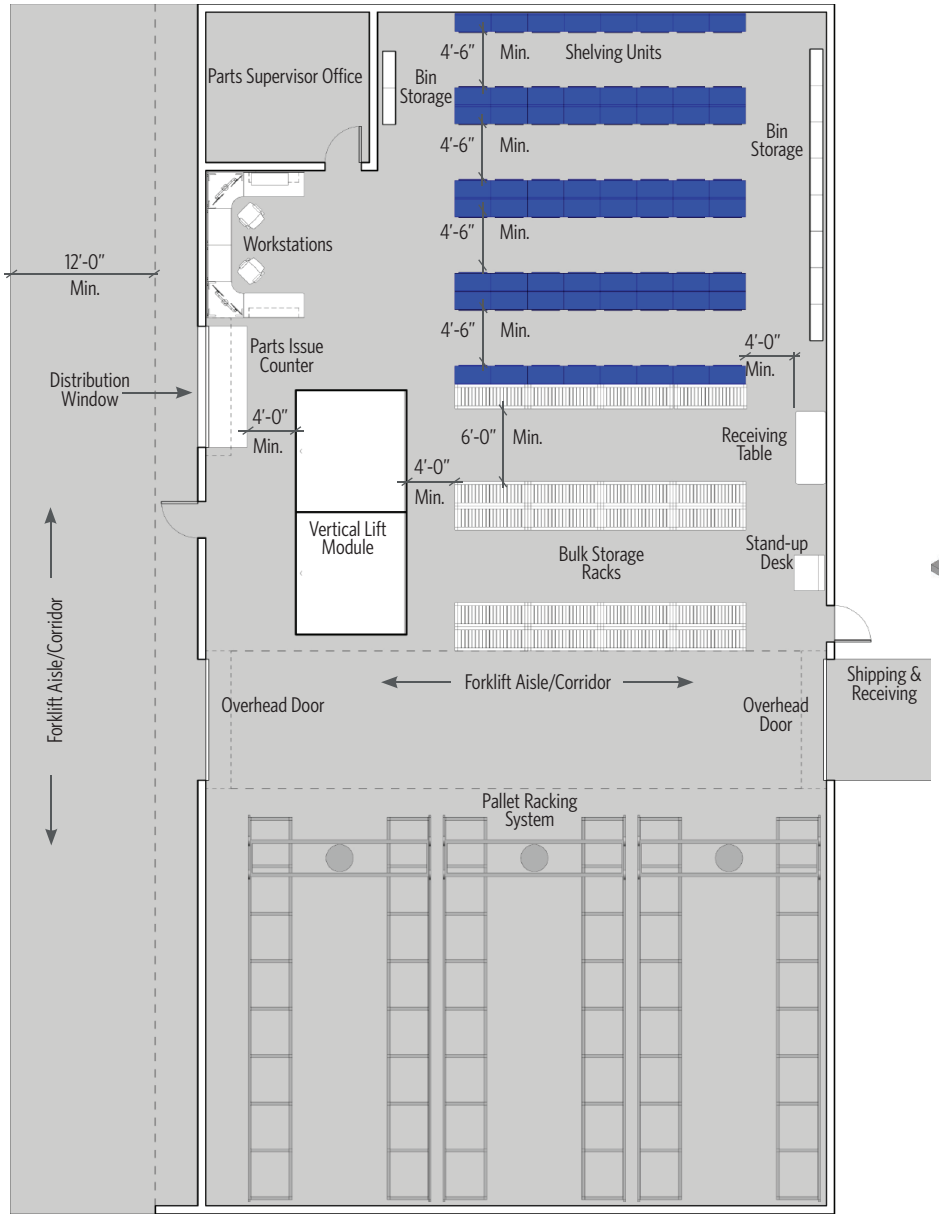
EQUIPMENT/FURNISHINGS

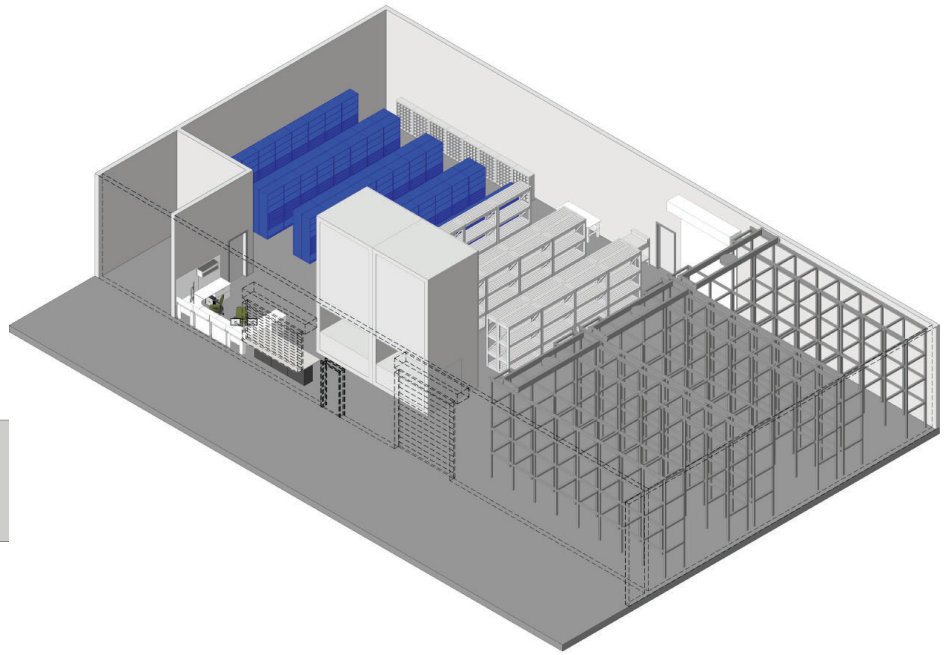
- Counter, upper and lower cabinets, sink with water filter, microwaves, refrigerators, coffee maker, ice maker, water coolers, vending machines, trash/recycling/compost bins, tables, chairs
- Millwork

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" doors (two minimum) with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Plumbing: Rough-in for equipment
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
  - ✓ Provide three GFCI outlets above the kitchenette counter
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

PARTS WINDOW/SHOPKEEPER/PARTS STORAGE/SHIPPING AND RECEIVING





PARTS WINDOW/SHOPKEEPER/PARTS STORAGE/SHIPPING AND RECEIVING

FUNCTION

Dedicated secure area for receiving, storage, and issuing of parts, material, and specialized tools.

RELATIONSHIP TO OTHER AREAS

- Access to exterior for deliveries
- Adjacent to Parts Office
- Access from Repair Bays and Shops

CRITICAL DIMENSIONS

- Vertical clearance below mezzanine: 12'-0" (minimal) (if mezzanine is desired)
- Vertical clearance above mezzanine: 15'-0" (minimum)(if mezzanine is desired)
- 20'-0" clear for high bay pallet storage (minimum)
- VLM or stack system can be any desired height

EQUIPMENT/FURNISHINGS

- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Exterior access for deliveries
- Provide Issue Counter with stainless steel top and fire rated rolling overhead door
- Provide staging area for shipping/receiving with an overhead door to exterior of building
- Forklift access
- Parts deliveries should be as functionally separated and as secure as possible in relation to any public accessible and joint development area in the basement.

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish
- Doors:
  - ✓ Personnel door with view panel to meet applicable code exit requirements
  - ✓ Exterior overhead door: High-lifting sectional, steel, insulated 10'-0" by 12'-0" with view panels, automatic operator, interior and exterior push button controls with lockout on exterior
  - ✓ Overhead door at Issue Window
  - ✓ Interior overhead door: Coiling steel, 10'-0" by 12'-0", automatic operator, push controls, lockable

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access

MECHANICAL CONSIDERATIONS

- Cooling set point: 74 degrees Fahrenheit
- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- In-floor radiant heat (if desired)
- As required by equipment

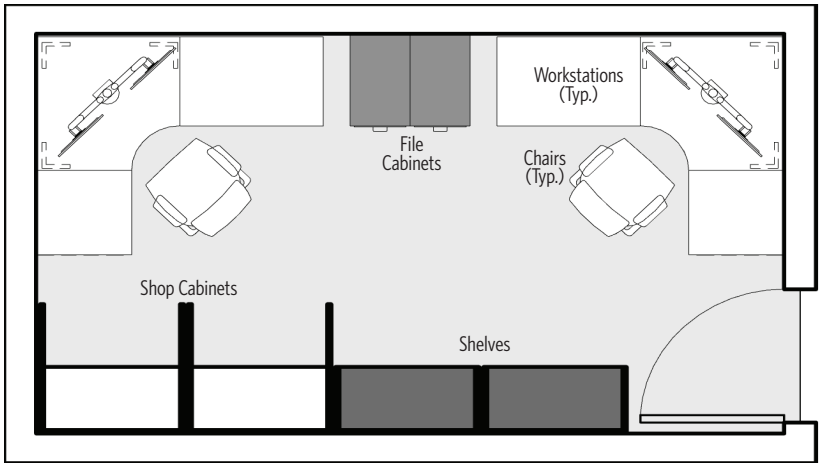
PLUMBING CONSIDERATIONS

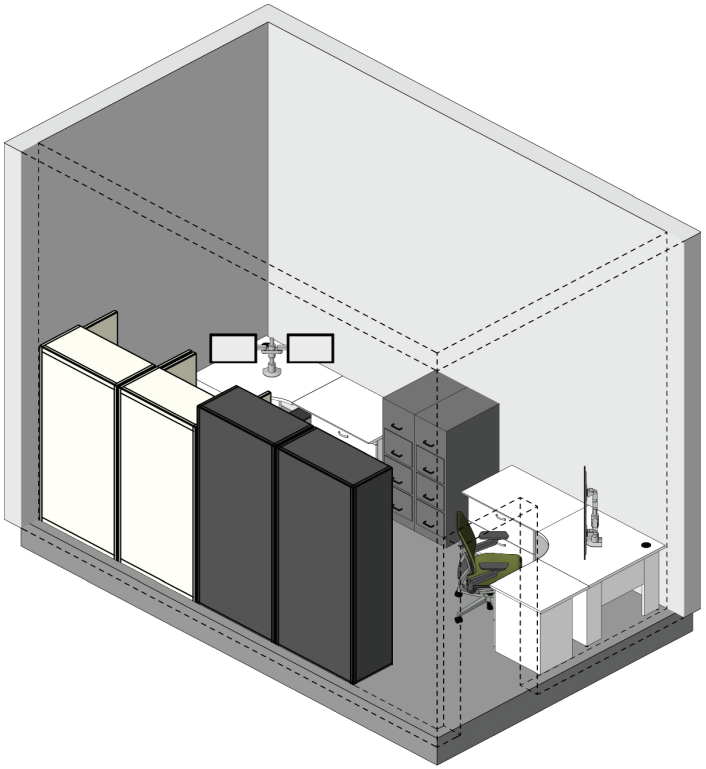
- Water: 3/4" water hose bibb with standard hose bibb at 2'-0" AFF
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommended lighting levels for Parts Window, Shipping/ Receiving, and Shopkeeper (35 fc average) and Storage Area (20 fc average)
  - ✓ Fixtures located to illuminate work spaces
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

RECEIVING OFFICE





FUNCTION

Workstations and storage for Receiving staff.

RELATIONSHIP TO OTHER AREAS

- Access to Parts Window/Shopkeeper/Parts Storage/ Shipping and Receiving/ Dock

CRITICAL DIMENSIONS

- 12’-0” vertical clearance to structure and fixtures

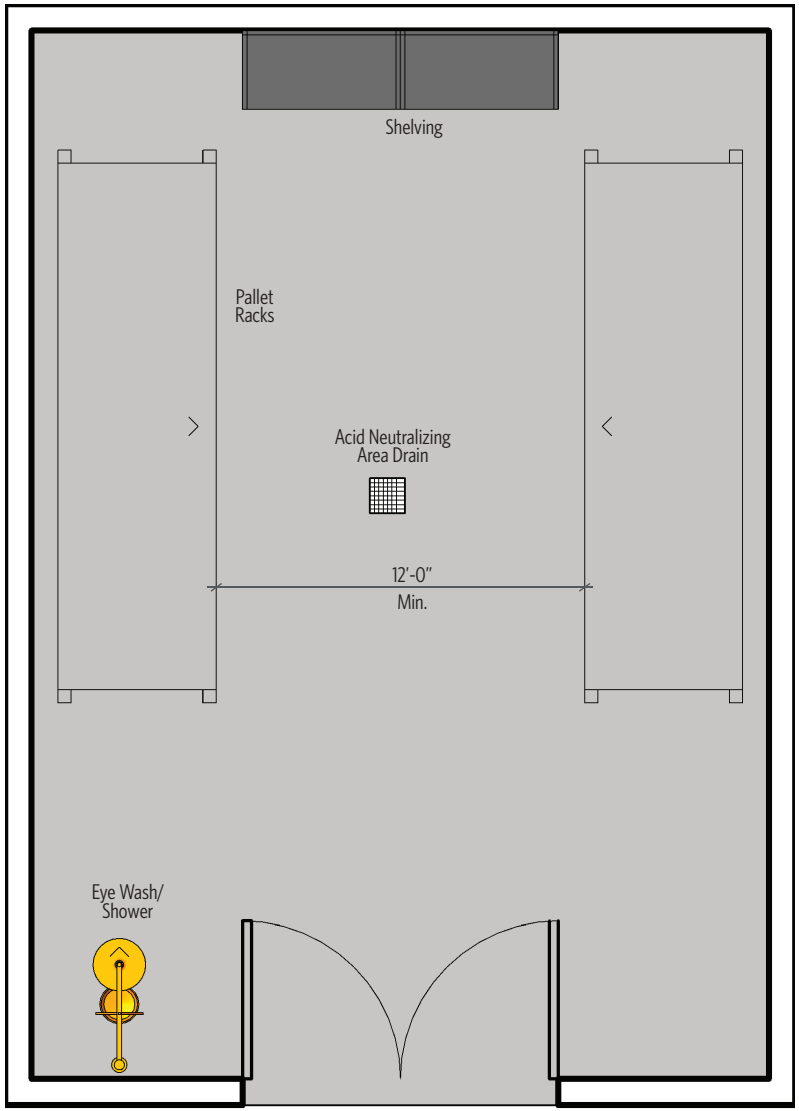
EQUIPMENT/FURNISHINGS

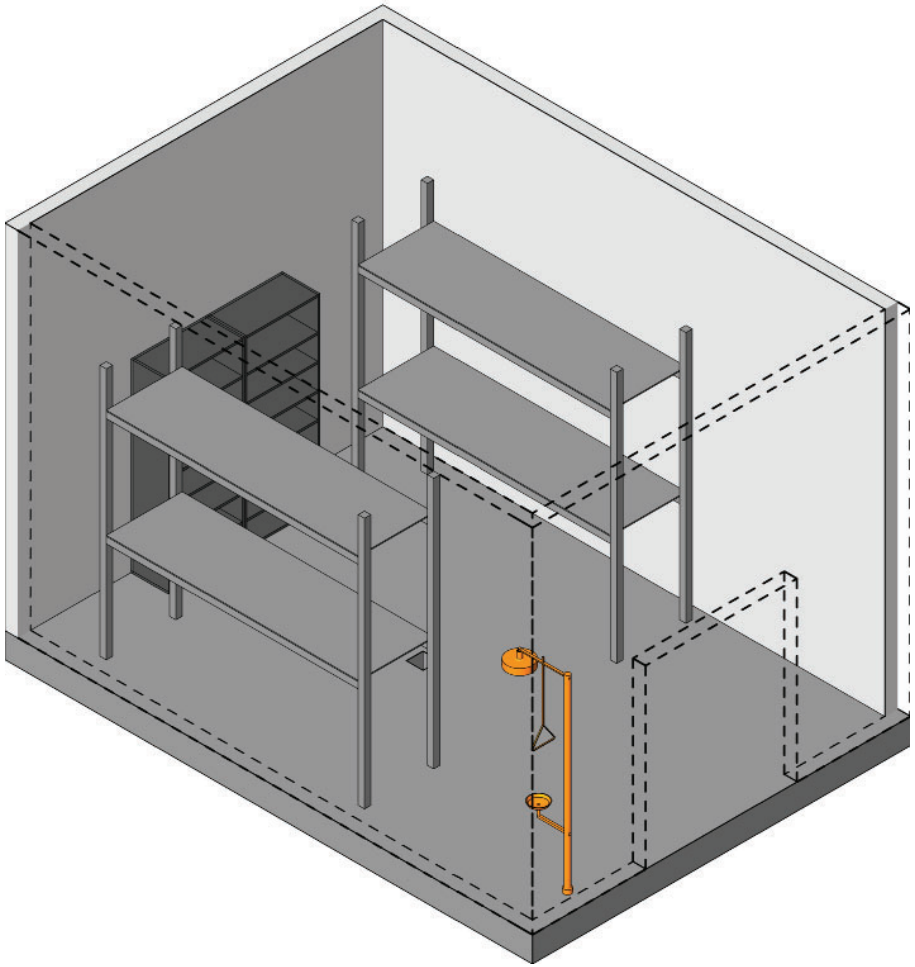
- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Soil, grease, water, slip resistant concrete, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish
  - ✓ Doors: Personnel door with view panels to meet applicable code exit requirements (not required with wire mesh walls)
- Structural:
  - ✓ Control joints in floor slab at adequate spacing
  - ✓ Floor slab to accommodate in-floor radiant heat (if desired)
  - ✓ Structure as needed to support equipment
  - ✓ Floor slab designed to accommodate forklift access
- Mechanical:
  - ✓ In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ As required by equipment
- Power:
  - ✓ All receptacles and outlets at 3’-6” AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting: LED lighting in accordance with IES recommendation minimum (20 fc average)

BATTERY STORAGE





BATTERY STORAGE

FUNCTION

Enclosed and secure room for storage of trolley and future BEBs batteries and components.

RELATIONSHIP TO OTHER AREAS

- Access from Repair Bays and Shops

CRITICAL DIMENSIONS

- 12'-0" vertical clearance to structure and fixtures (minimum)

EQUIPMENT/FURNISHINGS

- Emergency eyewash/shower
- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Acoustically and physically separated from other areas to prevent migration of noise, dirt, and fumes

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete, and treated with chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finished concrete or masonry, with polyurea coatings for acid and chemical resistance
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities with light colored finish
- Doors:
  - ✓ Personnel door with view panel to meet applicable code exit requirements
  - ✓ Double 3'-0" wide doors

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)
- Floor slab designed to accommodate forklift access

MECHANICAL CONSIDERATIONS

- Heating set point: 65 degrees Fahrenheit
- Exhaust (per code)
- General ventilation (per code)
- As required by equipment

PLUMBING CONSIDERATIONS

- Tempered water: Connection to emergency eye wash/ shower
- Acid neutralizing floor drain and piping to acid dilution tank

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles on walls
  - ✓ Dedicated computer receptacle, adjacent to data conduit on column adjacent to workbench
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum, explosion proof (20 fc average)
  - ✓ Fixtures located to illuminate work spaces
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns at each bay

FIRE SUPPRESSION CONSIDERATIONS

The fire protection and pyrotechnics experts on the detailed design team will be responsible for devising a robust fire protection system for the tire bay and tire shop/storage areas that minimizes risk to the Yard and any joint development above. Review and recommendations by the experts will include, but not be limited to, the location, ventilation, and fire suppression systems for Potrero Yard's tire facilities.

SECTION 5.7: MAINTENANCE - ADMINISTRATION

GENERAL MODULE: OFFICE AREAS

SUPERINTENDENT

- Reference **Office Module Private Office - 224 sf**
- Adjacent to Assistant Superintendent
- Adjacent to Administrative Assistant

ASSISTANT SUPERINTENDENT

- Reference **Office Module Private Office - 120 sf**
- Adjacent to Superintendent
- Adjacent to Administrative Assistant

SENIOR CONTROLLER

- Reference **Office Module Private Office - 120 sf**
- Adjacent to Assistant Superintendent
- Adjacent to Administrative Assistant

ADMINISTRATIVE ASSISTANT

- Reference **Office Module Workstation - 48 sf**
- Adjacent to Superintendent and Assistant Superintendent

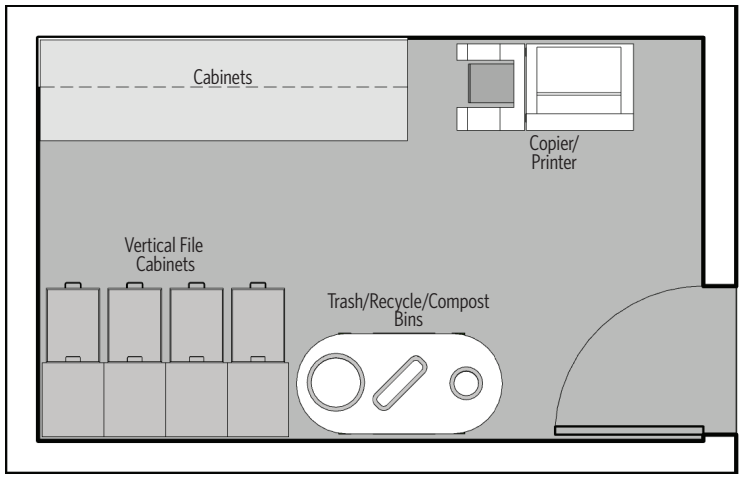
HOTELING - WORKSTATION

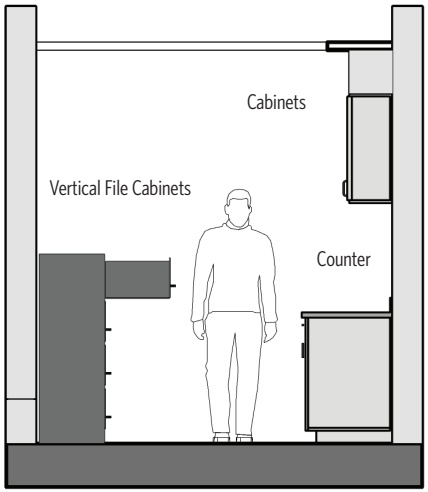
- Reference **Office Module Workstation - 64 sf**
- Located within open office space
- Access to copy/supply

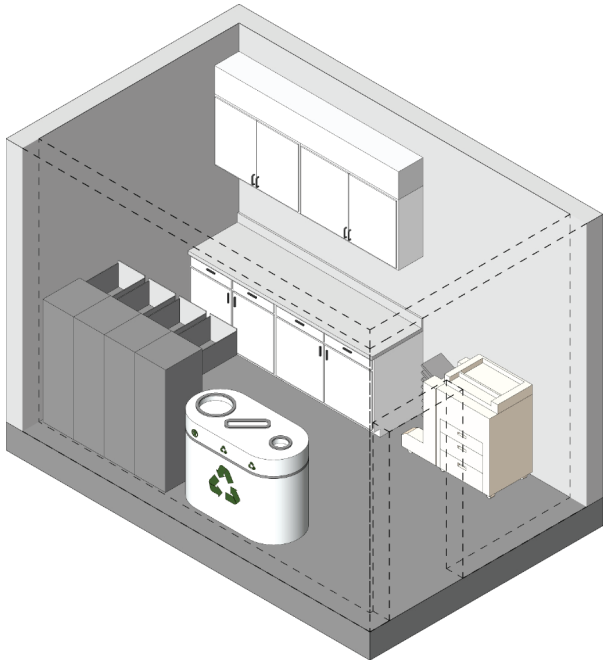
SUPPORT SHOP

- Reference **Office Module Workstation - 64 sf**
- Located within open office space
- Access to copy/supply

COPY/SUPPLY







FUNCTION

Dedicated alcove or room for copier/printer/scanner/fax machine, storage for office supplies, and a work surface.

RELATIONSHIP TO OTHER AREAS

- Access to all office areas

CRITICAL DIMENSIONS

- 9' -0" vertical clearance (minimum)

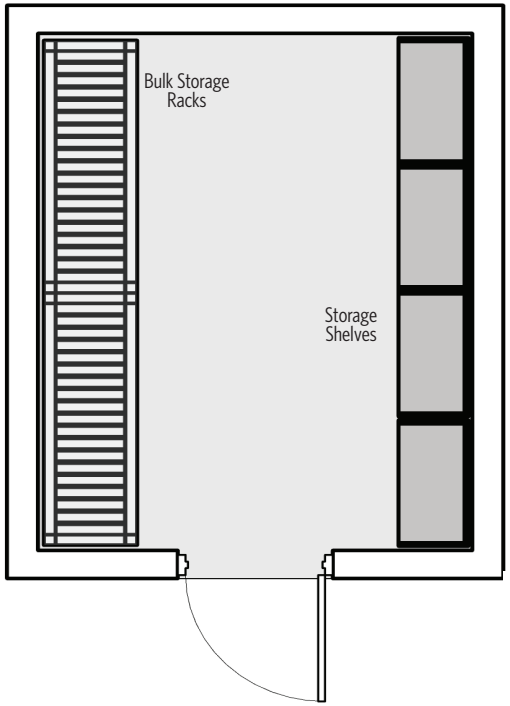
EQUIPMENT/FURNISHINGS

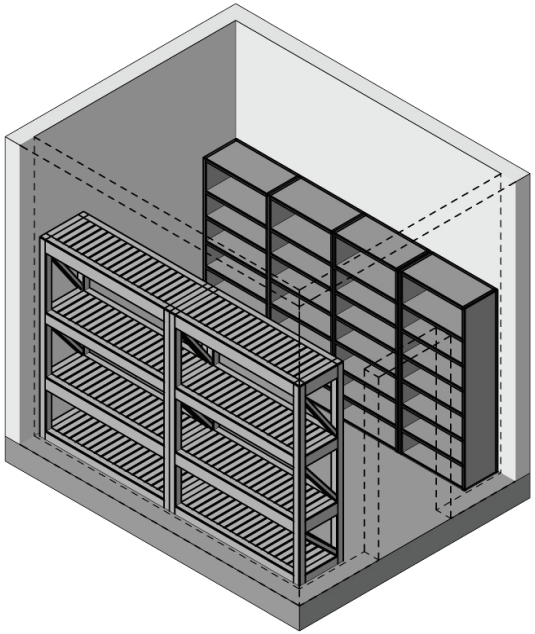
- Copier/printer/scanner/fax machine
- Work surface with cabinets below and above
- Filing cabinets
- Millwork

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
  - ✓ Provide one data outlet with four data ports
  - ✓ Provide box conduit rough-ins to three other locations in the room
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

RECORDS STORAGE





FUNCTION

Secure area for the storage of files and records.

RELATIONSHIP TO OTHER AREAS

- N/A

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

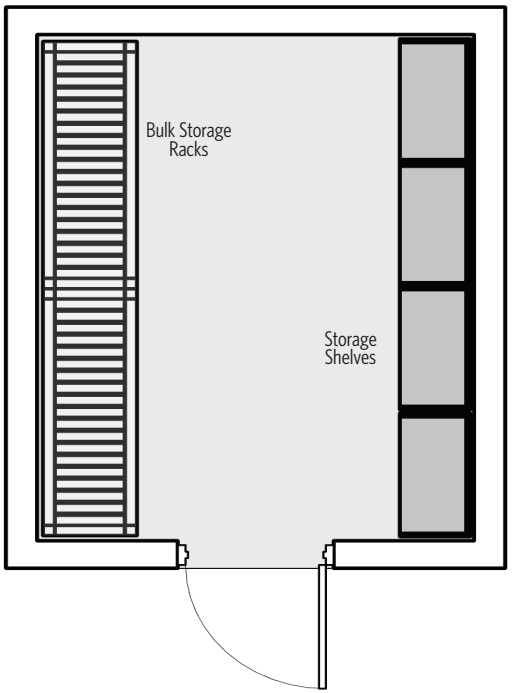
EQUIPMENT/FURNISHINGS

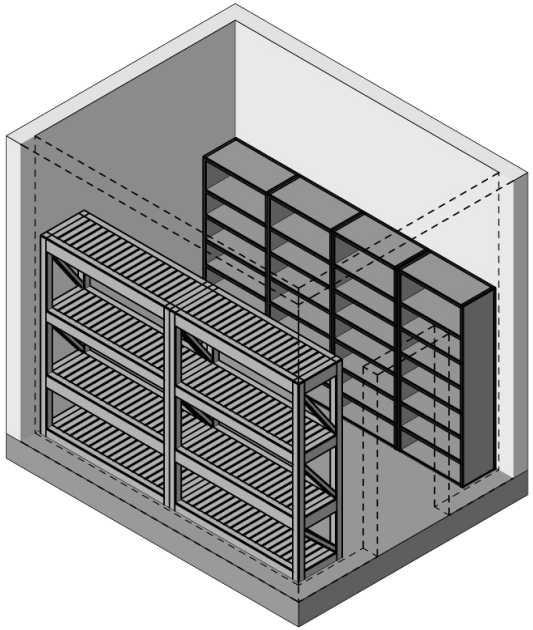
- Shelving
- Racking

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: No exterior exposure
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Keep consistent humidity levels
- Power:
  - ✓ LED lighting in accordance with IES recommendation (35 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensors

ARCHIVE RECORDS STORAGE





FUNCTION

Secure area for the long term storage of archived files and records.

RELATIONSHIP TO OTHER AREAS

- N/A

CRITICAL DIMENSIONS

- 9’-0” vertical clearance (minimum)

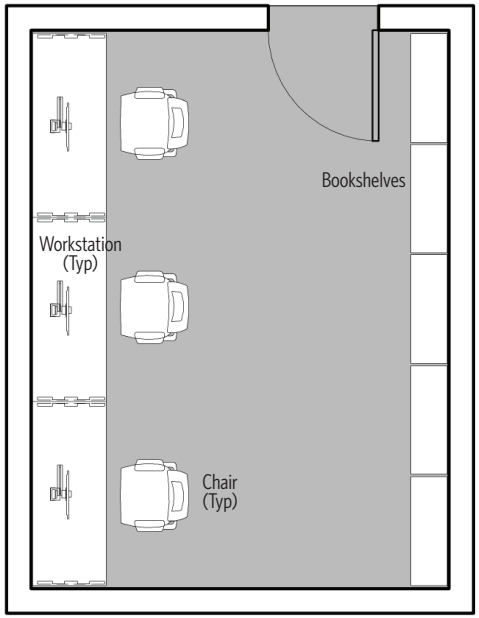
EQUIPMENT/FURNISHINGS

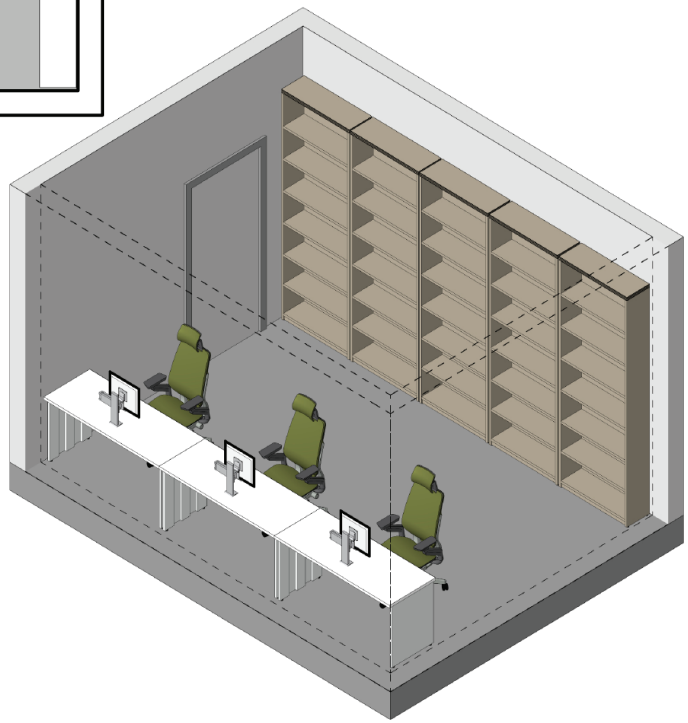
- Shelving
- Racking

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 3’-0” door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: No exterior exposure
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Keep consistent humidity levels
- Power:
  - ✓ LED lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensors

LIBRARY/ONLINE RESOURCES





FUNCTION

Enclosed area for storage and reference of vehicle maintenance reference manuals and materials.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Repair Bays
- Adjacent to Maintenance-Administration open office area

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

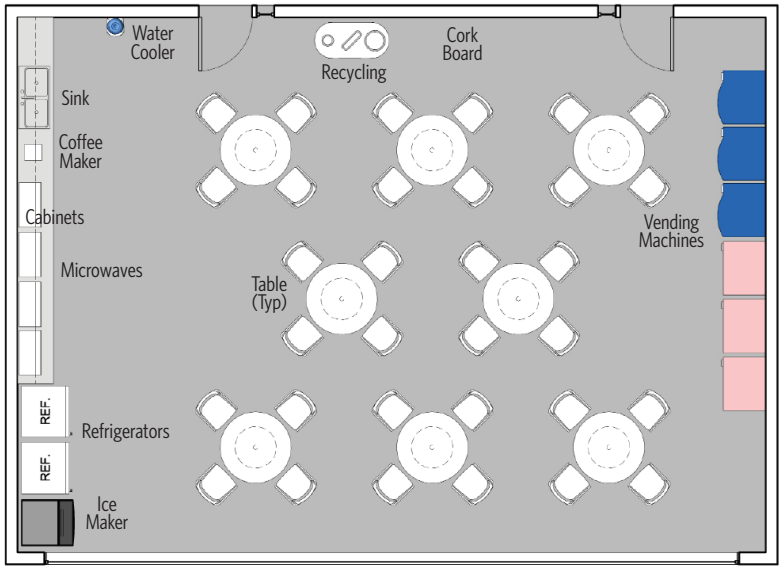
EQUIPMENT/FURNISHINGS

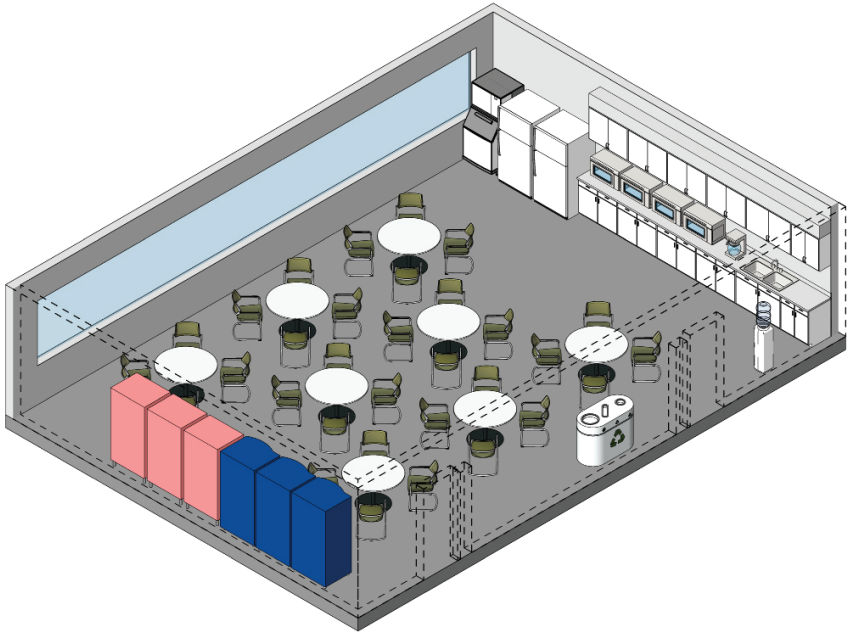
- Workstations
- Bookshelves
- Chairs

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc of indirect lighting average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a quad receptacle at each workstation
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

BREAK ROOM/KITCHENETTE/VENDING





FUNCTION

Enclosed room for use by staff as a break area.

RELATIONSHIP TO OTHER AREAS

- Centrally located
- Access to all office areas, repair areas, and Restrooms

CRITICAL DIMENSIONS

- 9' -0" vertical clearance (minimum)

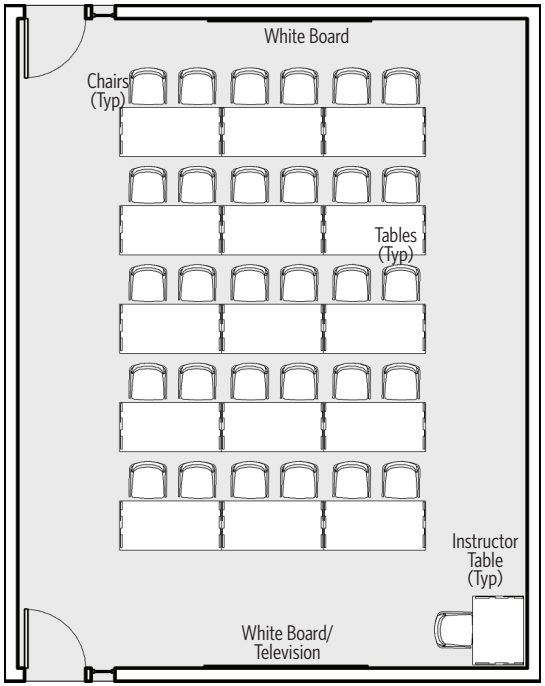
EQUIPMENT/FURNISHINGS

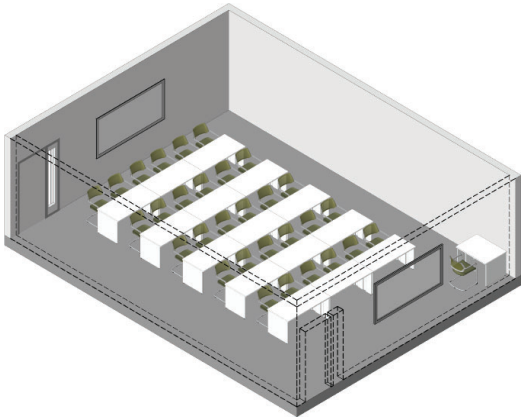
- Counter space, upper and lower cabinets, sink, microwaves, refrigerators, coffee maker, ice maker, water filter, vending machines, water coolers, tables, chairs, trash/recycling/compost bins
- Millwork

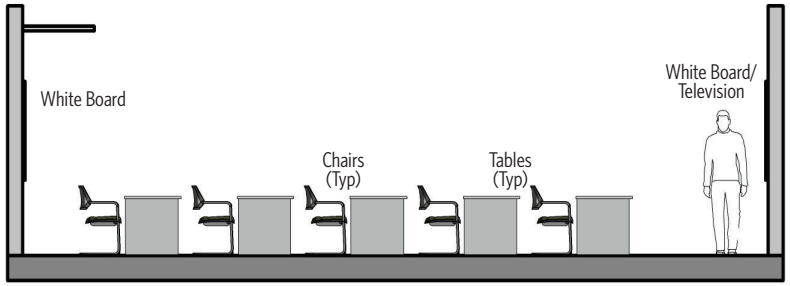
DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" doors (two minimum) with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Provide CO_2 detection
- Plumbing: Rough in for equipment
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
  - ✓ Provide data outlets with four data ports (two minimum)
  - ✓ Provide five GFCI outlets above kitchenette counter
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

TRAINING ROOM







FUNCTION

Large room for staff to participate in training activities. This space will also be available as a Conference Room, with training as the primary activity.

RELATIONSHIP TO OTHER AREAS

- Accessible by Maintenance staff
- Adjacent to Maintenance Office area

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

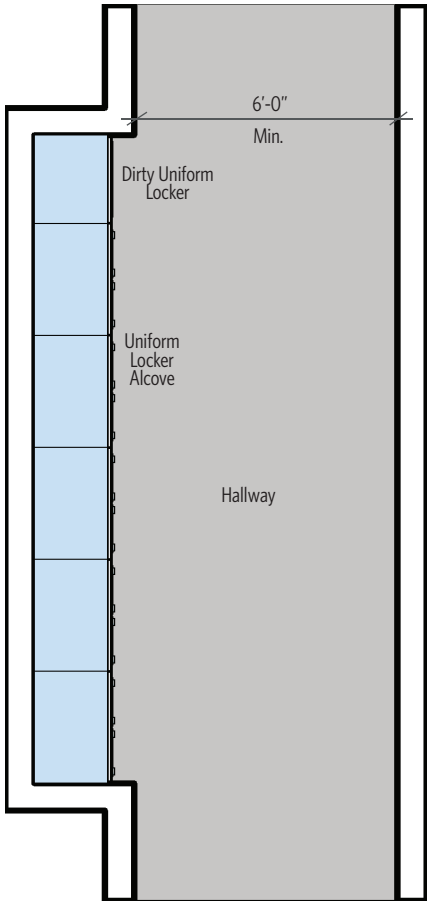
EQUIPMENT/FURNISHINGS

- Mayline Cohere Flip/nest table 60" by 30" laminate
- Cool mesh nesting chairs
- Whiteboard/Television
- Overhead projector
- Millwork

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Resilient floor covering with base (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Provide CO2 detection
- Power:
  - ✓ LED lighting in accordance with IES recommendations (35 fc average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in the room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

UNIFORM ALCOVE



FUNCTION

Co-ed locker area with an alcove for vendors to drop off and pick up uniforms (changing areas are located in the respective male/female restrooms).

RELATIONSHIP TO OTHER AREAS

- Accessible from Men's and Women's Lockers/Showers/Restroom
- Adjacent to an exterior door for vendor pickup/drop off

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

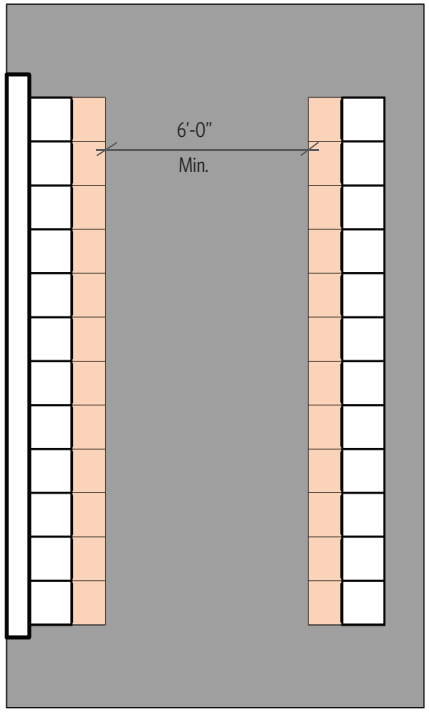
EQUIPMENT/FURNISHINGS

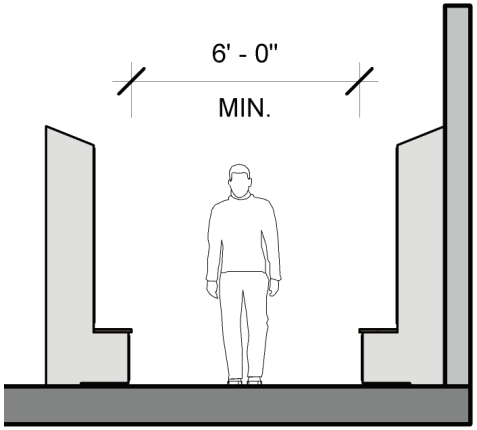
- Vendor provided well-ventilated uniform lockers, bin for dirty uniforms

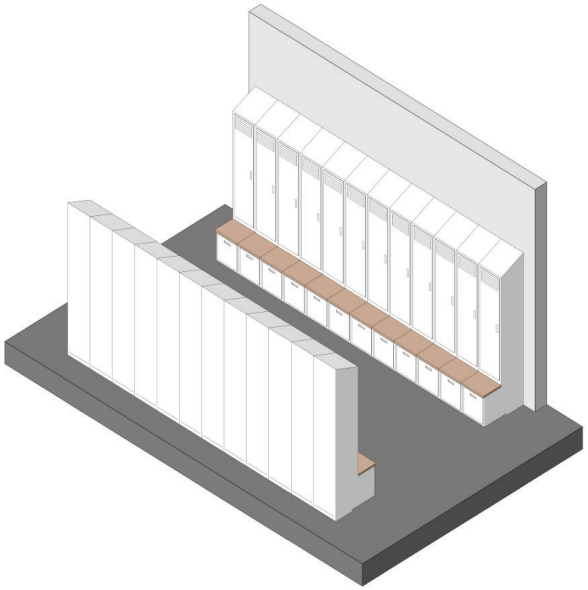
DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power: LED lighting in accordance with IES recommendation (15 fc average)
- Lighting: Dimmable, indirect lighting with occupancy sensor

MEN'S AND WOMEN'S LOCKERS







FUNCTION

Locker area for each male and female Bus Maintenance employees. Locker areas must be appropriately sized to meet the needs of Maintenance staff.

RELATIONSHIP TO OTHER AREAS

- Access by Repair and Shop Areas
- Located within each Men's and Women's Restrooms

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

EQUIPMENT/FURNISHINGS

- 6'-0" high gear, well-ventilated lockers with built-in bench
- Lockers must be ADA compliant and have mirrors
- Locker Dimensions: 24" by 24"
- Lockers to have sloped tops

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering or finished concrete (recommended)
  - ✓ Walls:
    - Tile covering or finished masonry
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors: Single leaf 3'-0" door
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating, ventilation, and exhaust (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (15 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

SECTION 5.8: OPERATIONS - ADMINISTRATION

GENERAL MODULE: OFFICE AREAS

SUPERINTENDENT

- Reference **Office Module Private Office - 224 sf**
- Adjacent to Assistant Superintendent
- Adjacent to Administrative Assistant

ASSISTANT SUPERINTENDENT

- Reference **Office Module Private Office - 120 sf**
- Adjacent to Administrative Assistant
- Adjacent to Superintendent

TRAINER

- Reference **Office Module Workstation - 64 sf**
- Access to Training Access Areas

YARD STARTER OFFICE

- Reference **Office Module Private Office - 120 sf**
- Adjacent to facility exit
- Views of buses coming off ramps through facility to exit

DISPATCH/RECEIVER

- Reference **Office Module Workstation - 64 sf**
- Within the Operator check-in
- Adjacent to Break Room
- Adjacent to restrooms

ADMINISTRATIVE ASSISTANT

- Reference **Office Module Workstation - 64 sf**
- Adjacent to Superintendent and Assistant Superintendent

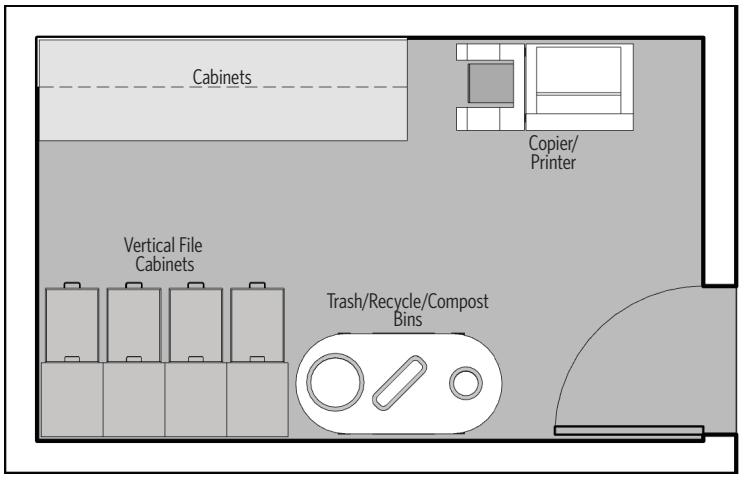
HOTELING - WORKSTATION

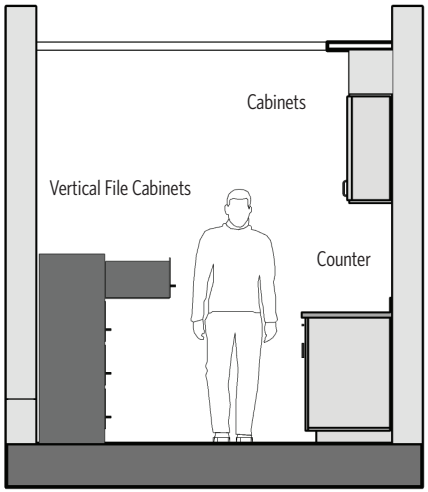
- Reference **Office Module Workstation - 64 sf**
- Located within open office space
- Access to Copy/Supply

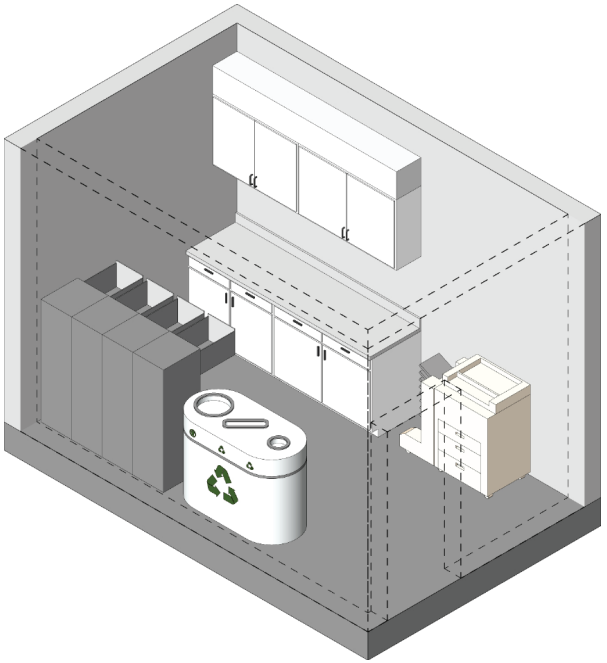
UNION SHARED OFFICE

- Reference **Office Module Private Office - 224 sf**
- Accessible by union staff

COPY/SUPPLY







FUNCTION

Dedicated alcove or room for copier/printer/scanner/fax machine, storage for office supplies, and with a work surface.

RELATIONSHIP TO OTHER AREAS

- Access to all office areas

CRITICAL DIMENSIONS

- 9' -0" vertical clearance (minimum)

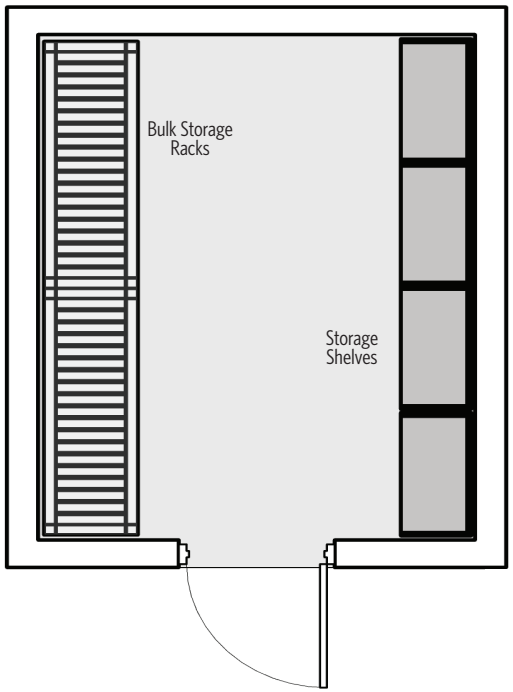
EQUIPMENT/FURNISHINGS

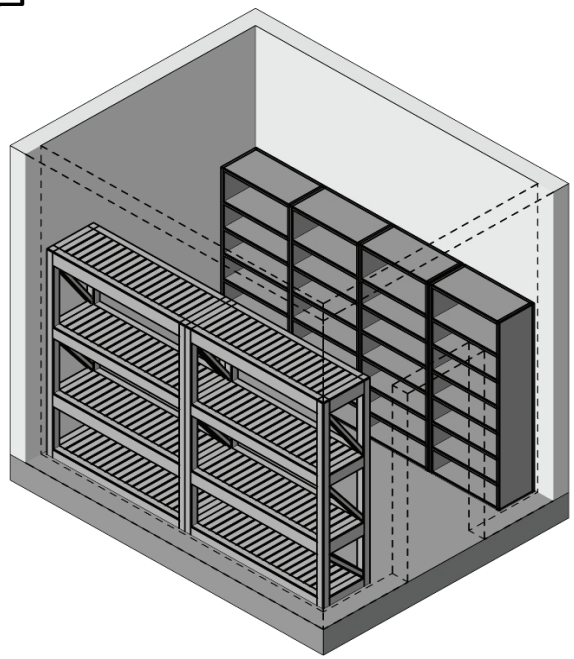
- Copier/printer/scanner/fax machine
- Work surface with cabinets below and above
- Filing cabinets
- Millwork

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
  - ✓ Provide one data outlet with four data ports
  - ✓ Provide box conduit rough-ins to three other locations in the room
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

RECORDS STORAGE





FUNCTION

Secure area for the long term storage of archived files and records.

RELATIONSHIP TO OTHER AREAS

- N/A

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

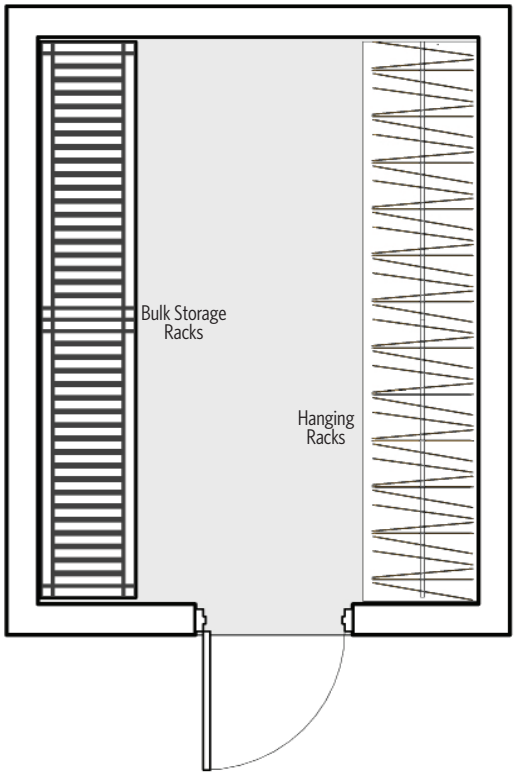
EQUIPMENT/FURNISHINGS

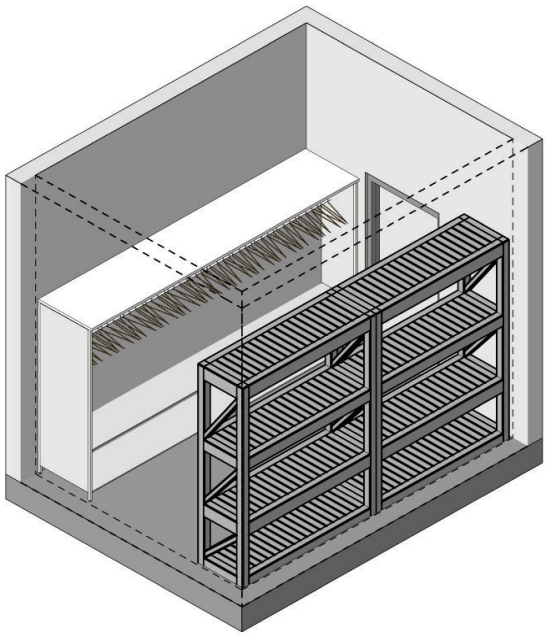
- Shelving
- Racking

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: No exterior exposure
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Keep consistent humidity levels
- Power:
  - ✓ LED lighting in accordance with IES recommendation (30 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensors

UNIFORM STORAGE





FUNCTION

Enclosed room for storage of Operator uniforms.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Operator Check-in

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

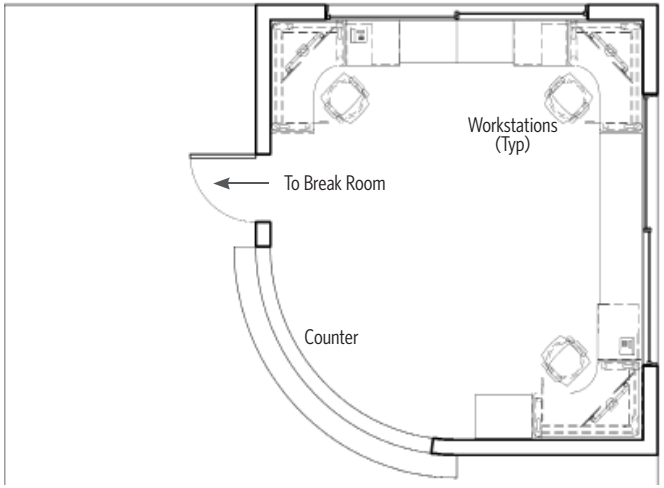
EQUIPMENT/FURNISHINGS

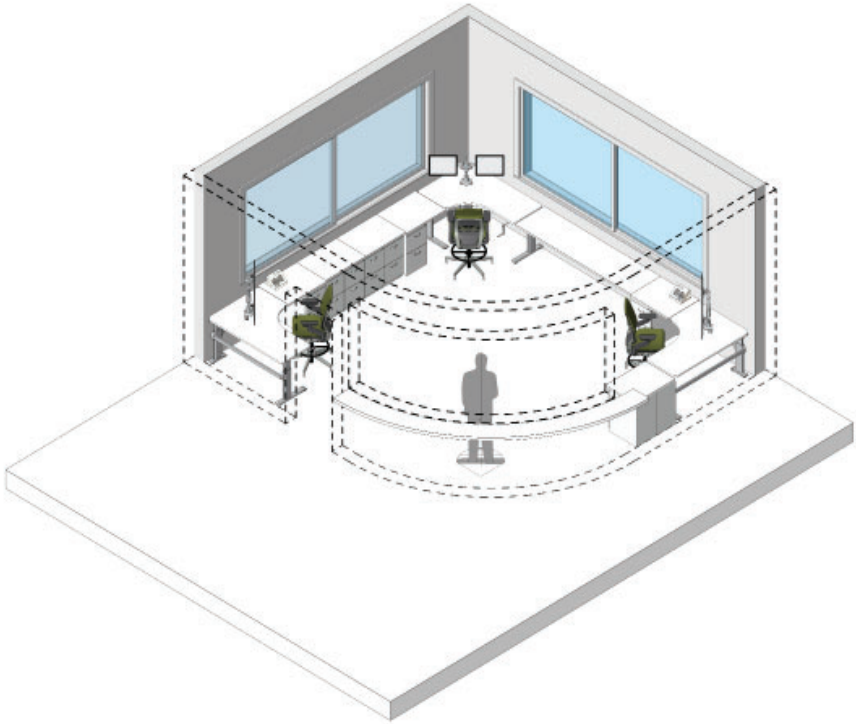
- Shelving
- Racking

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with loadable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED lighting in accordance with IES recommendation (15 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensor

OPERATOR CHECK-IN/ DISPATCH/ RECEIVER





FUNCTION

Area for Operators to report, receive information, and write reports.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Break Room
- Adjacent to Dispatch/Receiver

CRITICAL DIMENSIONS

- 9’-0” vertical clearance (minimum)

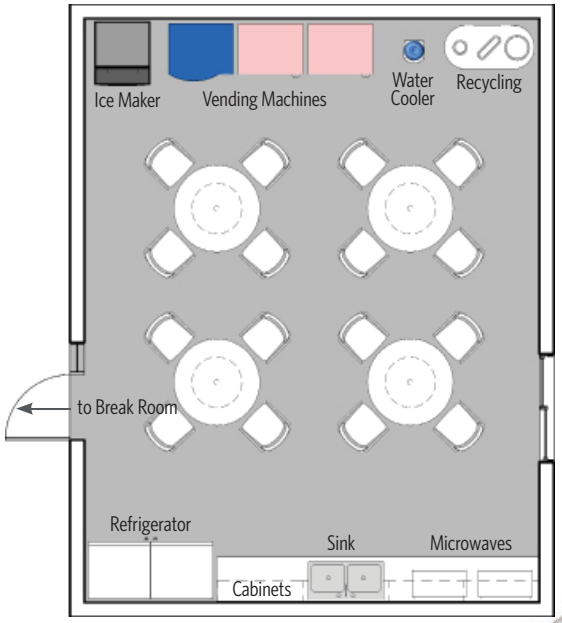
EQUIPMENT/FURNISHINGS

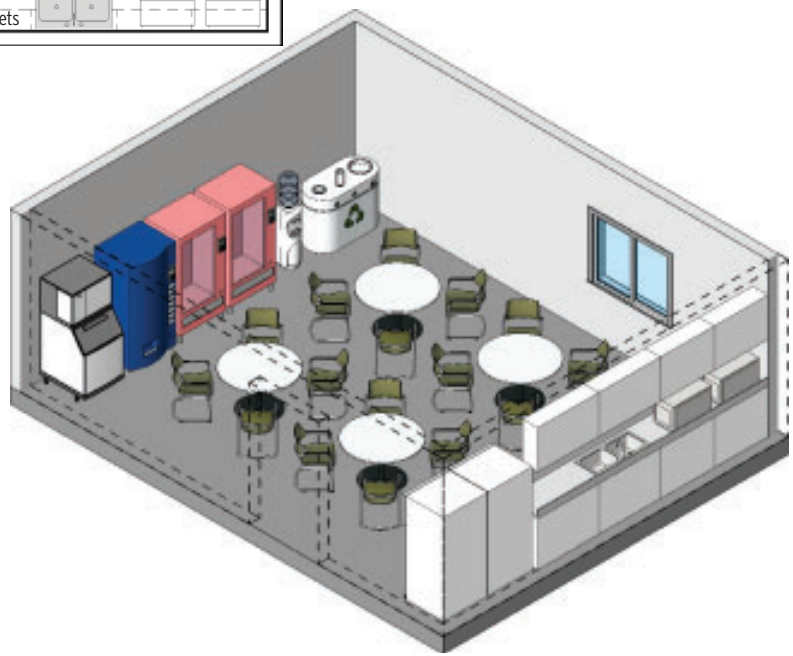
- Computer workstations
- Bulletin board
- Standing counter height, with portion of the counter at ADA accessible height

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED lighting in accordance with IES recommendation (20 fc of indirect lighting average, no glare)
  - ✓ Provide general purpose duplex receptacles (three minimum)
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and conduit rough-ins to three other locations in room
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

KITCHENETTE/VENDING





FUNCTION

Area used for staff to eat, prepare, and store food.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Break Room

CRITICAL DIMENSIONS

- 9' -0" vertical clearance (minimum)

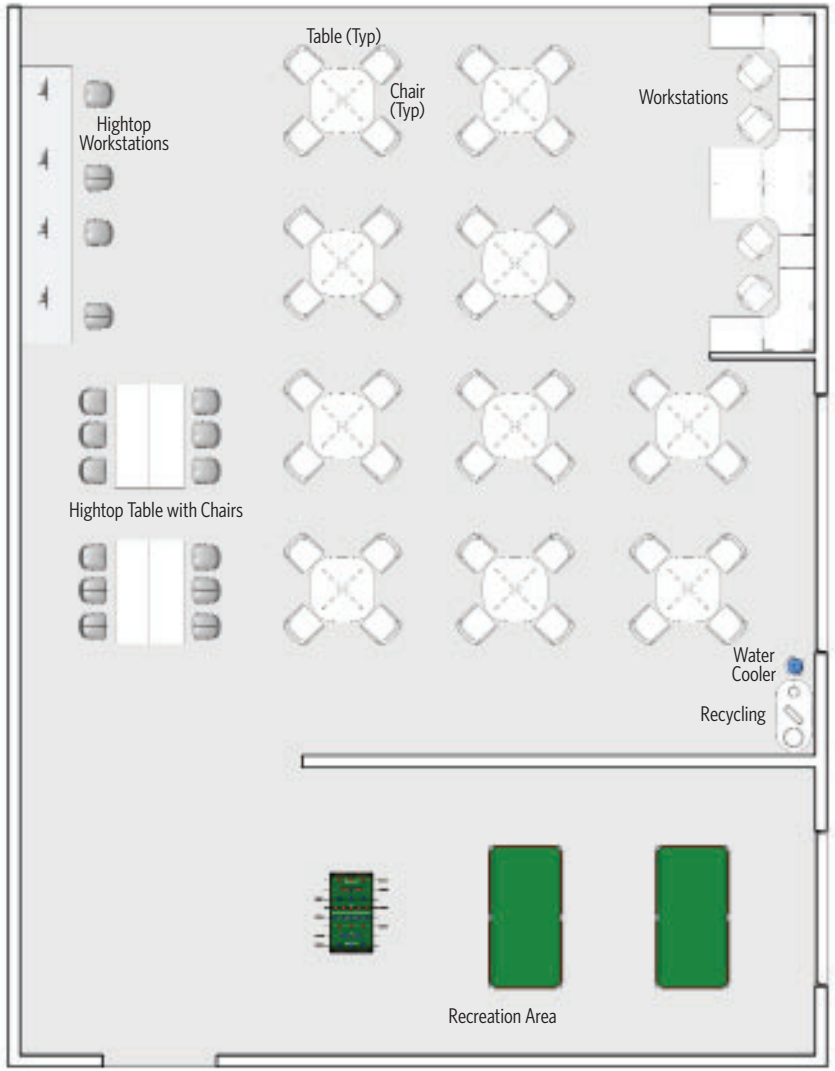
EQUIPMENT/FURNISHINGS

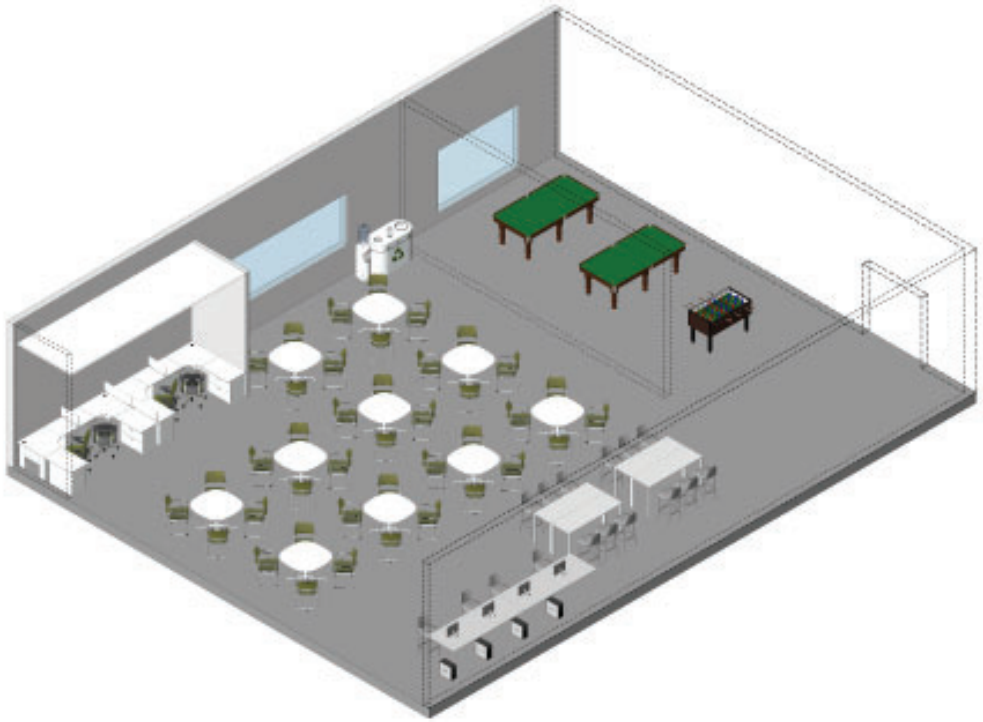
- Counter, upper and lower cabinets, sink with water filter, microwaves, refrigerators, coffee maker, ice maker, water coolers, vending machines, trash/recycling/compost bins, tables, chairs
- Millwork

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" doors (two minimum) with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Plumbing: Rough-in for equipment
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
  - ✓ Provide three GFCI outlets above the kitchenette counter
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

BREAK ROOM/RECREATION AREA





BREAK ROOM/RECREATION AREA

FUNCTION

Area for Operators to gather, take breaks, and relax between shifts.

RELATIONSHIP TO OTHER AREAS

- Connected to Kitchenette/Vending
- Adjacent to:
  - ✓ TV Room
  - ✓ Quiet Room
  - ✓ Restrooms
  - ✓ Lockers
  - ✓ Mailboxes
  - ✓ Operator Check-In
  - ✓ Dispatch/Receiver

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

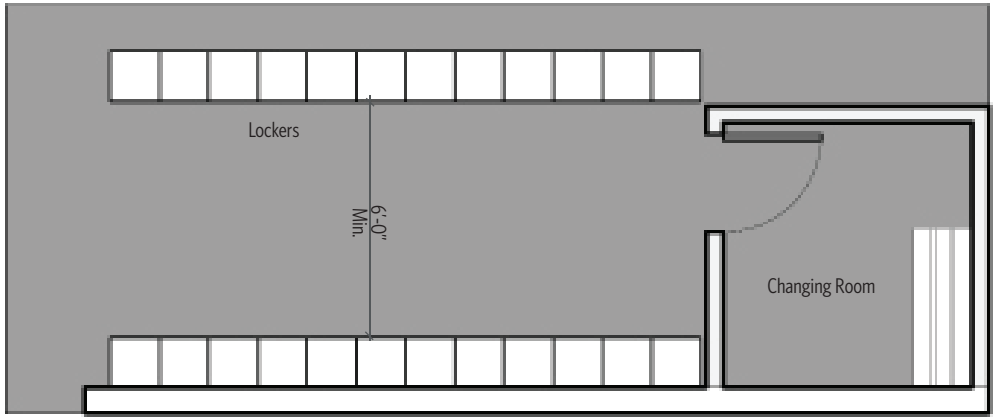
EQUIPMENT/FURNISHINGS

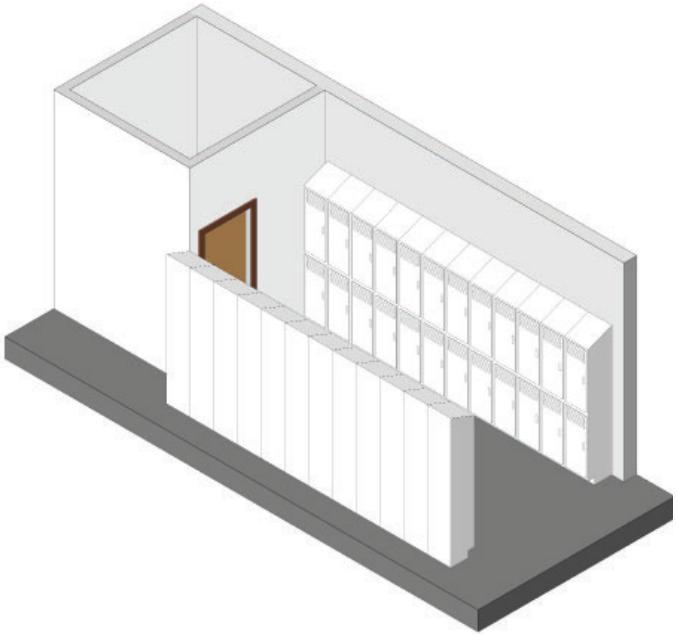
- Computer workstations
- Tables and chairs (no tables with attached chairs)
- Message and information televisions
- Chairs
- End tables
- Bulletin boards
- Recreation equipment
- Mailboxes
- Pool tables
- Alcove with workstation for incident reporting
- Millwork

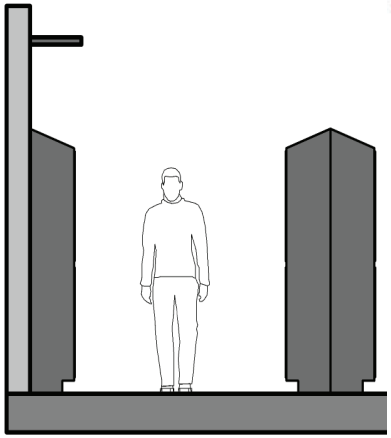
DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" doors (two minimum) with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Provide CO2 detection
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (30 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and conduit rough-ins to three other locations in room
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

LOCKERS







FUNCTION

Co-ed locker room with alcove for Operators to store personal gear and clothing in half-height lockers (Single person occupancy private changing area within locker room and private changing areas in respective restrooms as well).

RELATIONSHIP TO OTHER AREAS

- Connected to Break Room
- Adjacent to Restroom/Showers

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

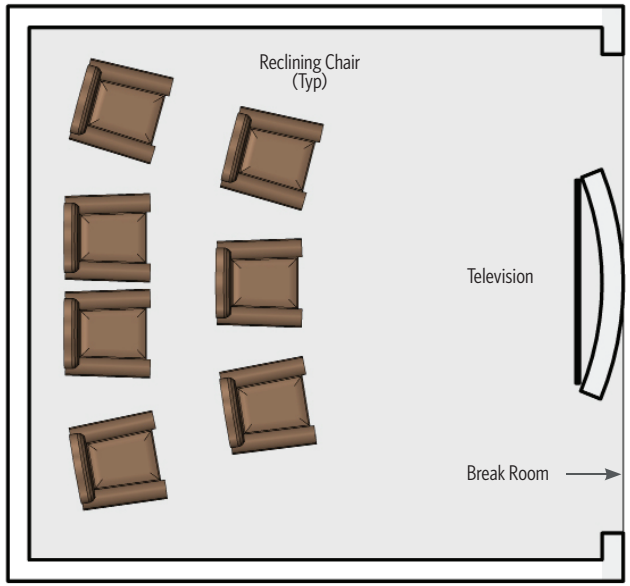
EQUIPMENT/FURNISHINGS

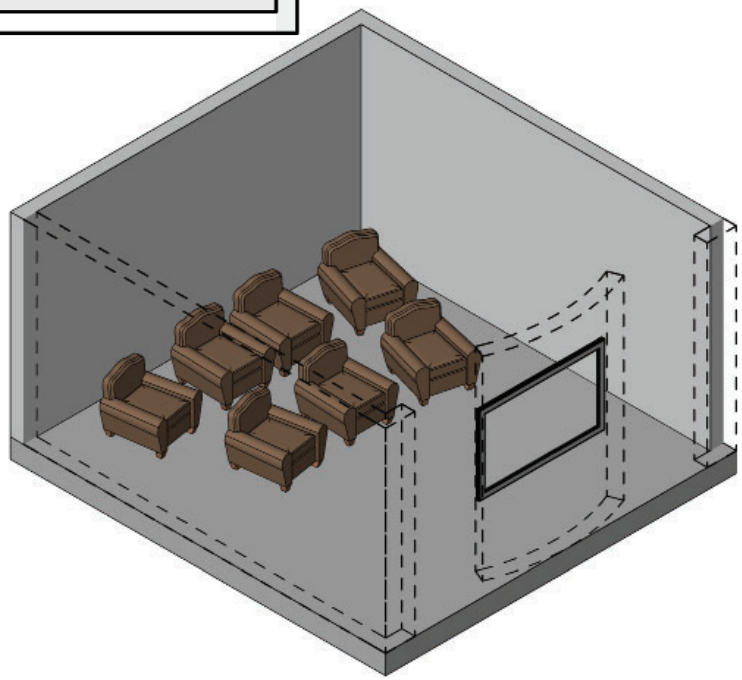
- Heavy duty, two tier, 3'-0", well-ventilated, half-height lockers; one each per Operator assigned to the facility
- Locker dimensions: 12" by 36"
- Lockers to have slant tops

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient covering or finished concrete (recommended)
  - ✓ Walls:
    - ○ Tile covering or painted masonry (recommended)
    - ○ Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors: Single leaf 3'-0" door
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating, ventilation, and exhaust (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

TV ROOM





FUNCTION

Enclosed room for Operators to watch television between, before, and after shifts.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Break Room

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

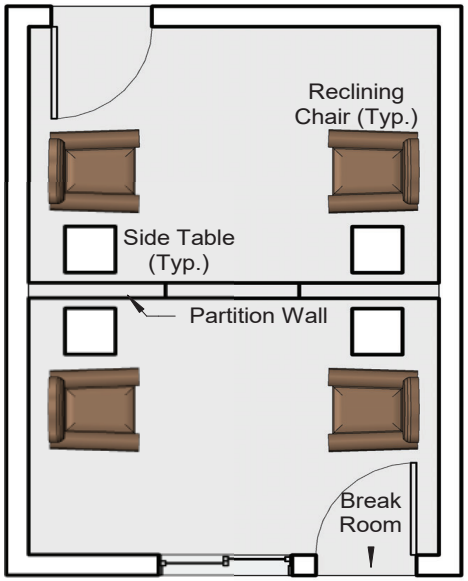
EQUIPMENT/FURNISHINGS

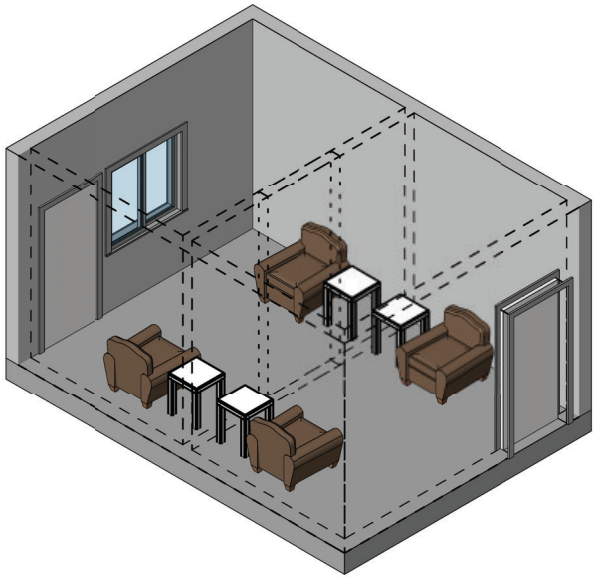
- Television
- Chairs
- End tables
- Table and chairs

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
- Daylighting: No exterior openings
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (15 fc indirect lighting average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
  - ✓ Provide one data outlet with four data ports at back of TV
  - ✓ Provide coax cable to building MPOE
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

QUIET ROOM





FUNCTION

Enclosed rooms for Operators to relax or sleep in a quiet environment between, before, and after shift.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Break Room

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

EQUIPMENT/FURNISHINGS

- Chairs
- Side tables

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors: Single leaf 3'-0" door
- Daylighting: No exterior openings
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc indirect lighting average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
- Lighting Control:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

SECTION 5.9: TRANSIT SERVICES (MRO)

GENERAL OFFICE MODULES

OPERATIONS MANAGER

- Reference **Office Module Private Office - 120 sf**
- Adjacent to Operations Manager
- Adjacent to Junior Management Assistant

OPERATIONS MANAGER

- Reference **Office Module Private Office - 120 sf**
- Adjacent to Operations Manager
- Adjacent to Junior Management Assistant

TRANSIT MANAGER II

- Reference **Office Module Workstation - 64 sf**
- Adjacent to Transit Operations Specialist
- Adjacent to Junior Management Assistant

TRANSIT OPERATIONS SPECIALIST

- Reference **Office Module Workstation - 64 sf**
- Adjacent to Transit Manager II
- Adjacent to Junior Management Assistant

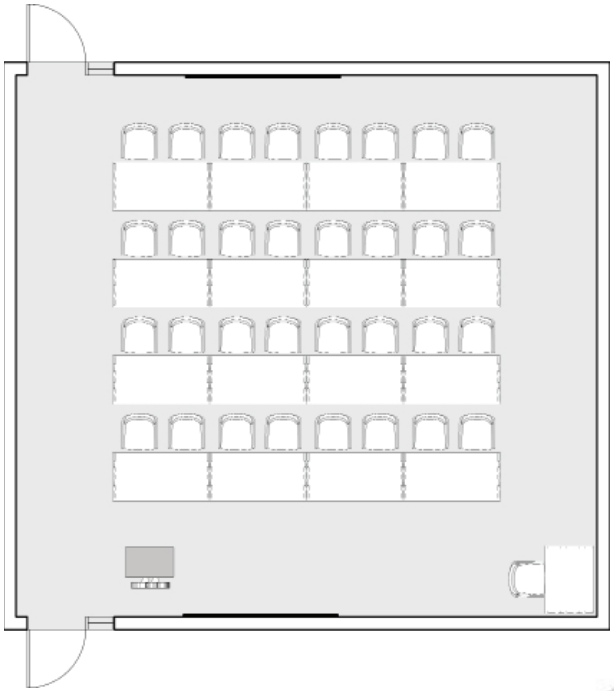
MRO, STREET OPERATORS

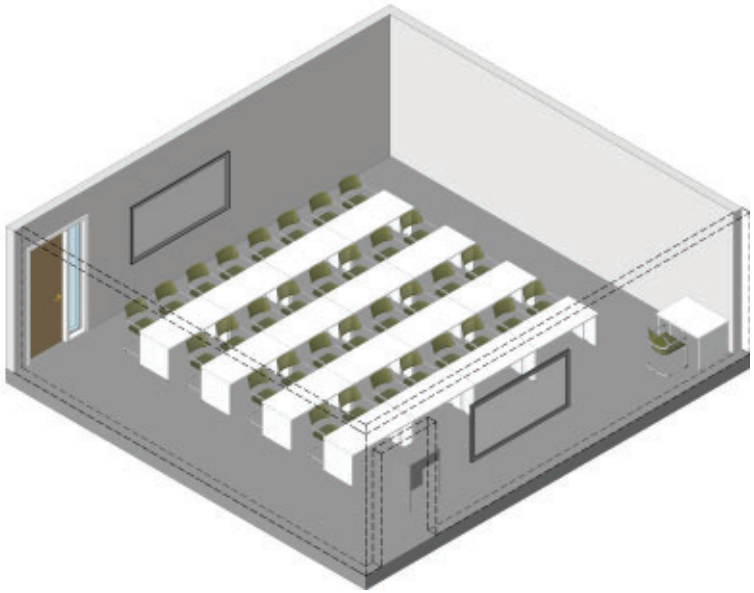
- Reference **Office Module Workstation - 30 sf**
- Adjacent to Office Areas

JUNIOR MANAGEMENT ASSISTANT

- Reference **Office Module Workstation - 64 sf**
- Adjacent to Operations Manager
- Adjacent to Operations Manager

CONFERENCE ROOM





FUNCTION

Room to accommodate up to ten people for meetings.

RELATIONSHIP TO OTHER AREAS

- Accessible from all departments in the building

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

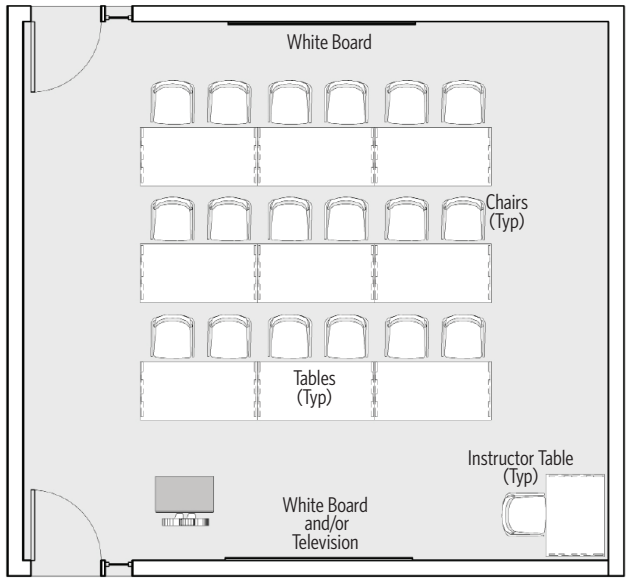
EQUIPMENT/FURNISHINGS

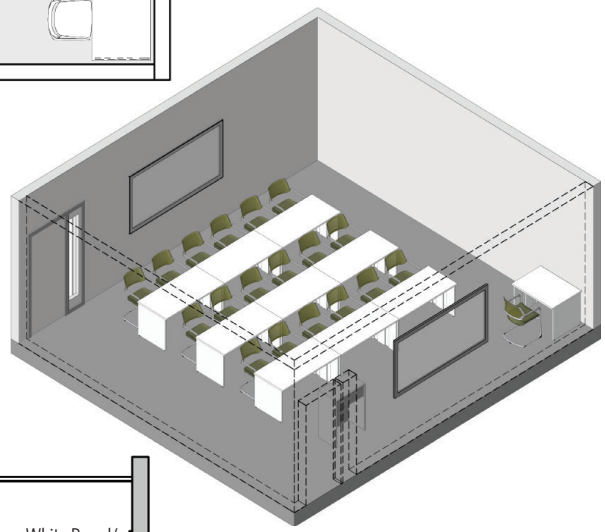
- Table
- Chairs
- White board and/or television
- Millwork

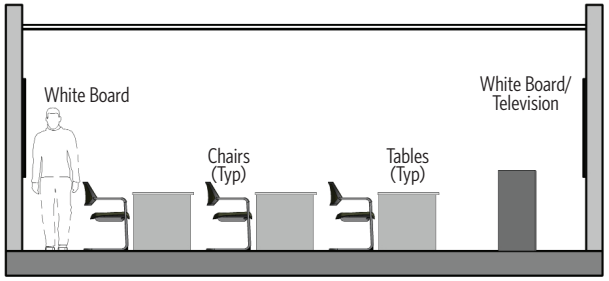
DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED lighting in accordance with IES recommendations (30 fc average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in the room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

TRAINING ROOM







FUNCTION

Room to accommodate up to 20 people for meetings or trainings.

RELATIONSHIP TO OTHER AREAS

- Accessible from all departments in the building

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

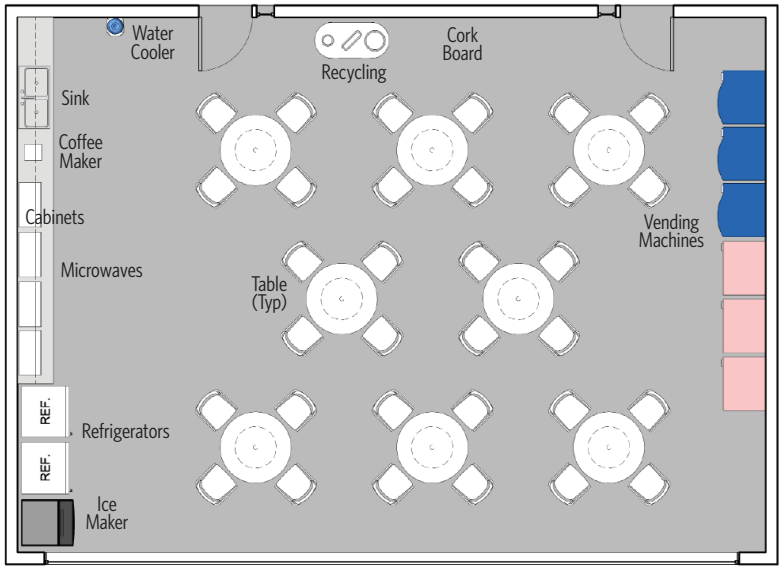
EQUIPMENT/FURNISHINGS

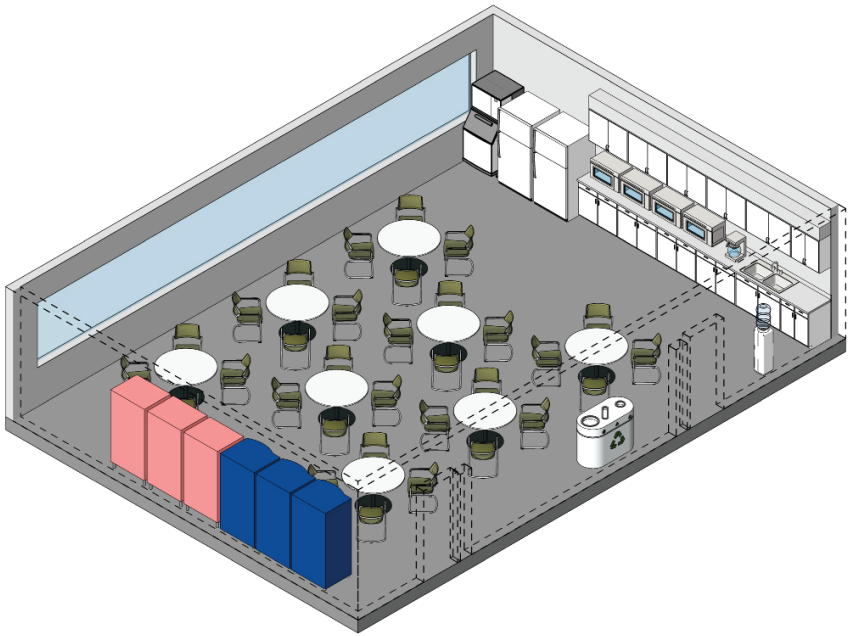
- Mayline Cohere Flip/nest table 60" by 30" laminate
- Cool mesh nesting chairs
- White board and/or television
- Millwork

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" doors with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED lighting in accordance with IES recommendations (30 fc average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in the room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

BREAK ROOM





FUNCTION

Enclosed room used as a break area for staff.

RELATIONSHIP TO OTHER AREAS

- Centrally located
- Access to all office areas, repair areas, and Restrooms

CRITICAL DIMENSIONS

- 9’ -0” vertical clearance (minimum)

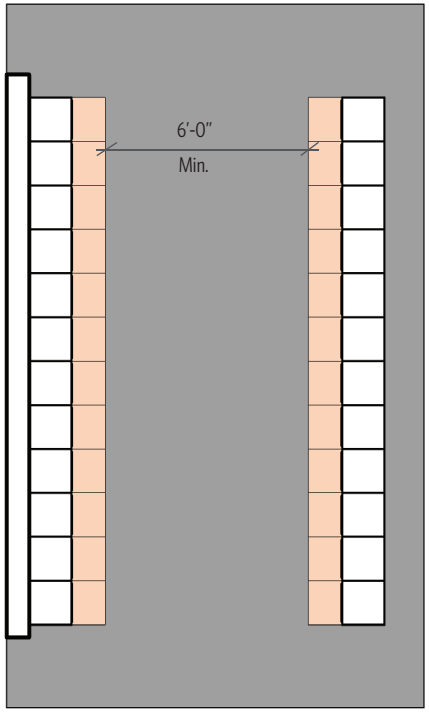
EQUIPMENT/FURNISHINGS

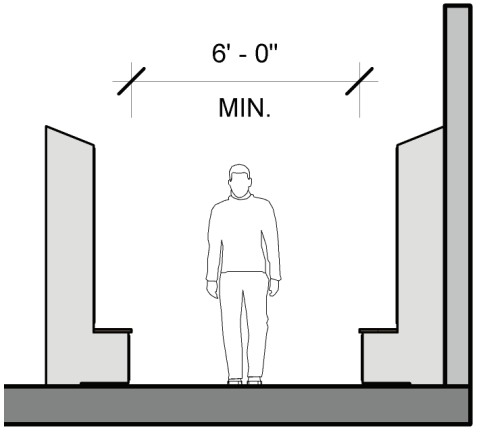
- Counter space, upper and lower cabinets, sink, microwaves, refrigerators, coffee maker, ice maker, water filter, vending machines, water coolers, tables, chairs, trash/recycling/compost bins
- Millwork

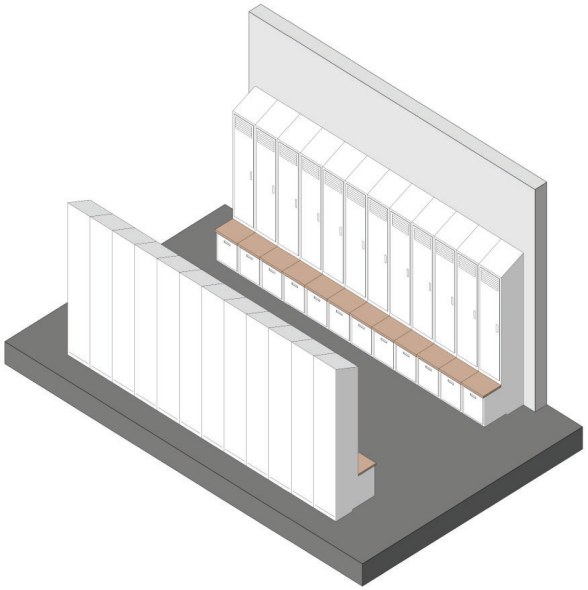
DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3’-0” doors (two minimum) with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Provide CO2 detection
- Plumbing: Rough in for equipment
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
  - ✓ Provide data outlets with four data ports (two minimum)
  - ✓ Provide five GFCI outlets above kitchenette counter
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

LOCKERS







FUNCTION

Locker area for each male and female Transit Services (MRO) employees. A few changing areas behind curtain or other partition will be provided.

RELATIONSHIP TO OTHER AREAS

- Access by Repair and Shop Areas
- Located within each Men's and Women's Restrooms

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

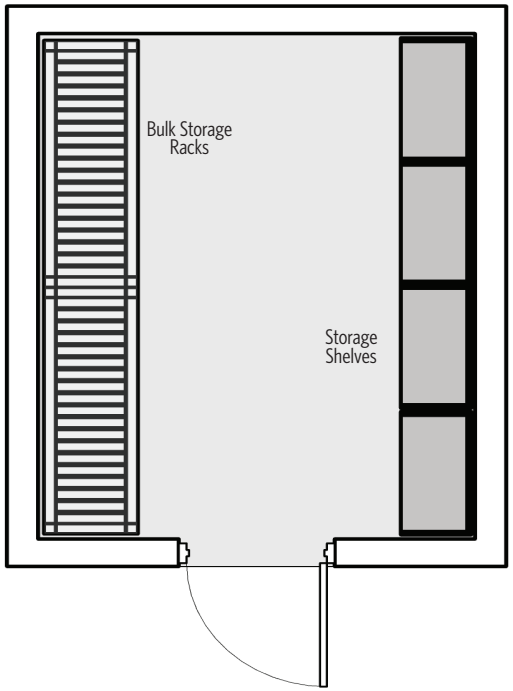
EQUIPMENT/FURNISHINGS

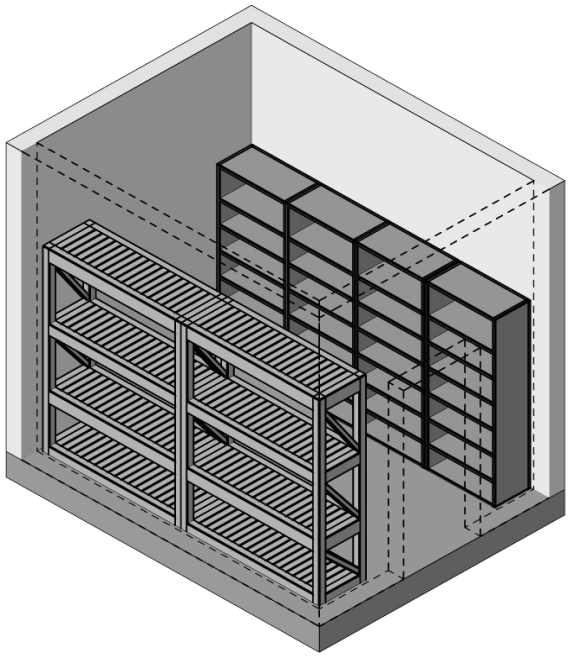
- 6'-0" high gear, well-ventilated lockers with built-in bench
- Lockers must be ADA compliant and have mirrors
- Locker Dimensions: 24" by 24"
- Lockers to have sloped tops

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering or finished concrete (recommended)
  - ✓ Walls:
    - ○ Tile covering or finished masonry
    - ○ Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors: Single leaf 3'-0" door
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating, ventilation, and exhaust (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (15 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

STORAGE





FUNCTION

Dedicated secure storage for Transit Service supplies.

RELATIONSHIP TO OTHER AREAS

- N/A

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

EQUIPMENT/FURNISHINGS

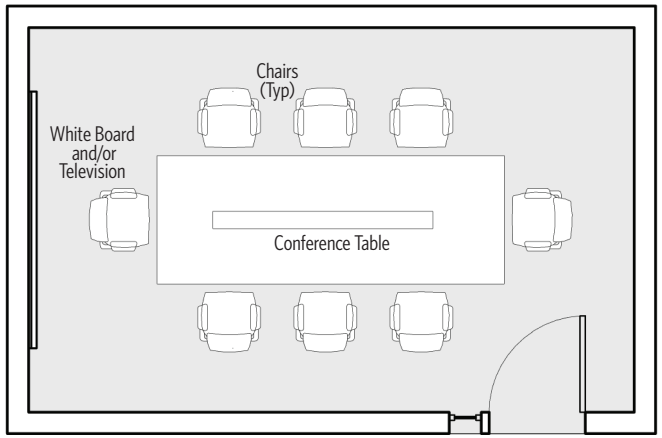
- Shelving
- Racking

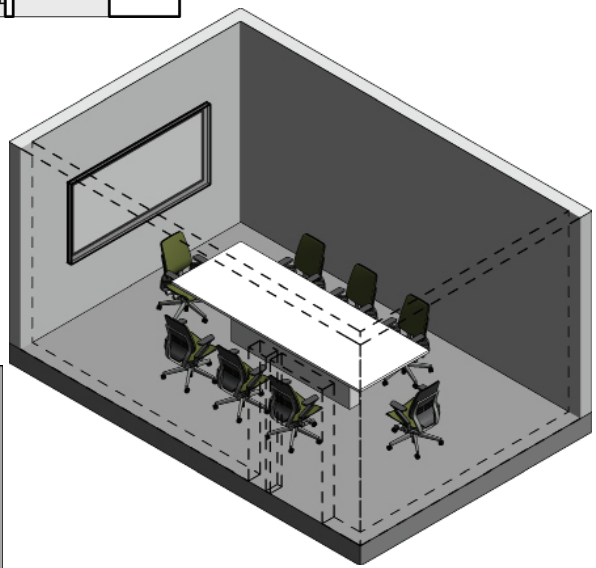
DESIGN FEATURES

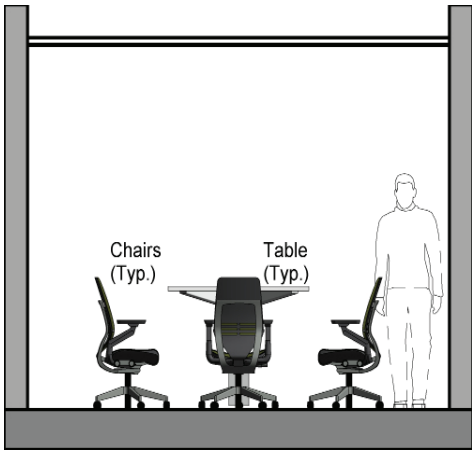
- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: No exterior exposure
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Keep consistent humidity levels
- Power:
  - ✓ LED lighting in accordance with IES recommendation (30 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensors

SECTION 5.10: SHARED

MEDIUM CONFERENCE ROOM







FUNCTION

Room to accommodate up to ten people for meetings.

RELATIONSHIP TO OTHER AREAS

- Accessible from all departments in the building

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

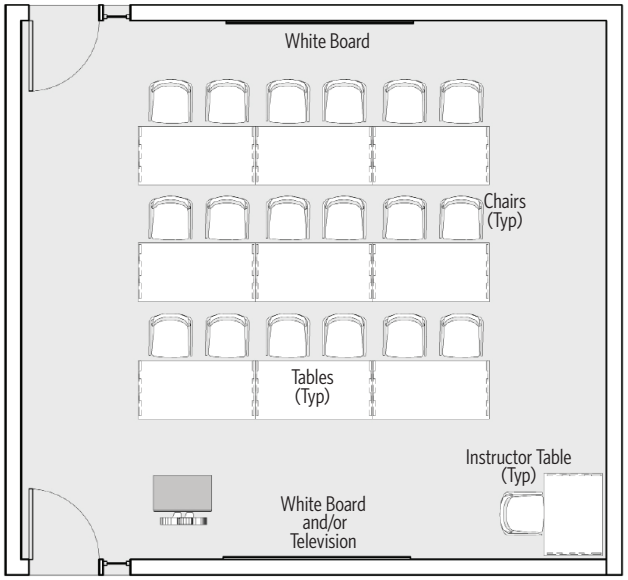
EQUIPMENT/FURNISHINGS

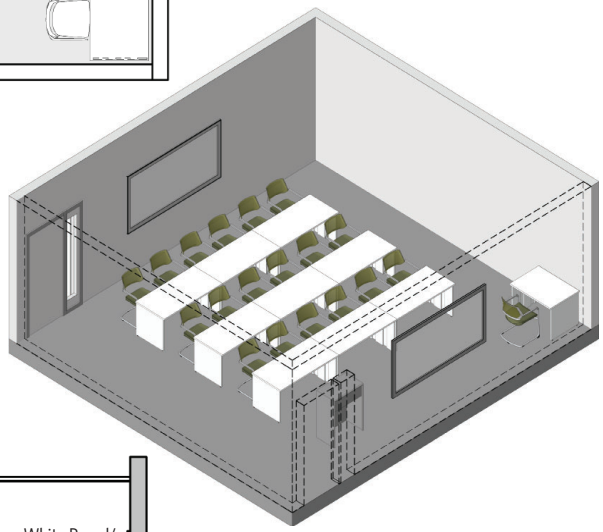
- Table
- Chairs
- White board and/or television
- Millwork

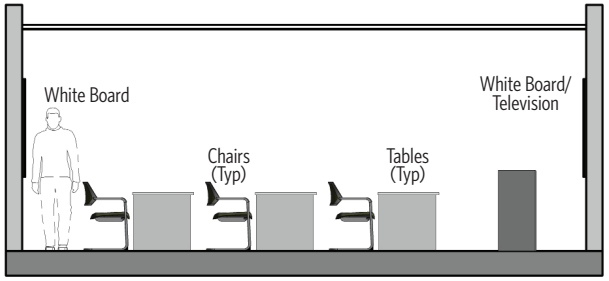
DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED lighting in accordance with IES recommendations (30 fc average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in the room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

LARGE CONFERENCE/SMALL TRAINING







FUNCTION

Room to accommodate up to 20 people for meetings or trainings.

RELATIONSHIP TO OTHER AREAS

- Accessible from all departments in the building

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

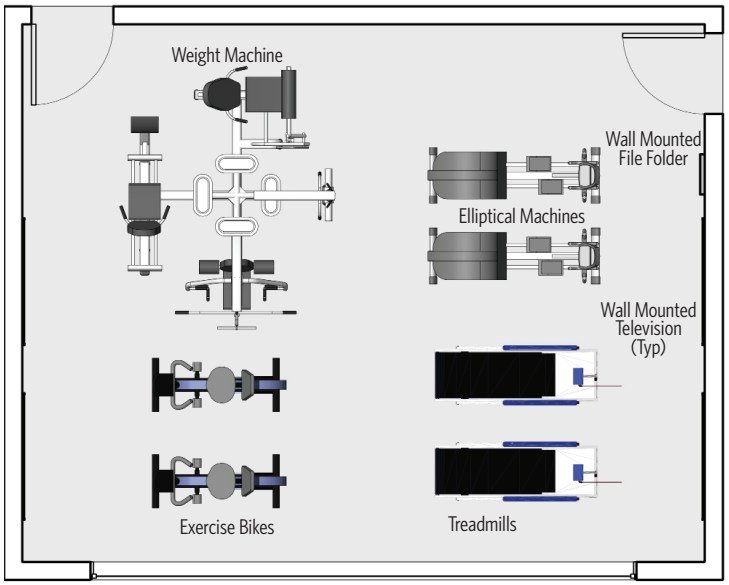
EQUIPMENT/FURNISHINGS

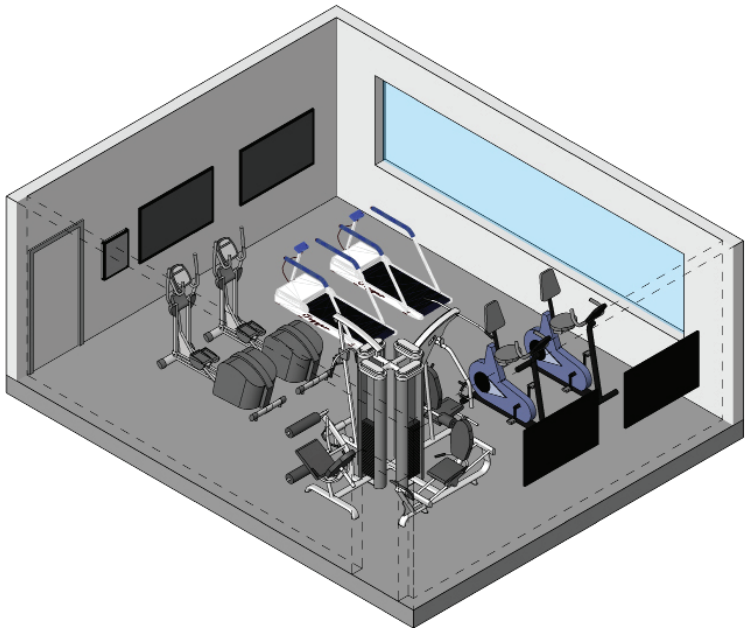
- Mayline Cohere Flip/nest table 60" by 30" laminate
- Cool mesh nesting chairs
- White board and/or television
- Millwork

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" doors with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED lighting in accordance with IES recommendations (30 fc average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in the room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

FITNESS ROOM





FUNCTION

Enclosed area with exercise equipment for employee fitness.

RELATIONSHIP TO OTHER AREAS

- Accessible from the Break Room, Lockers, and Restrooms and Showers

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

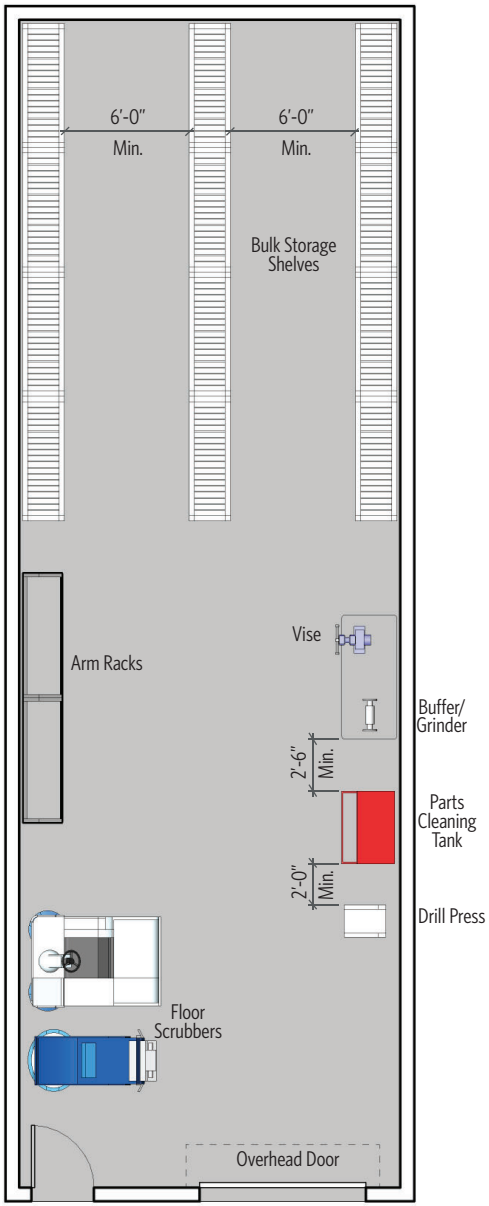
EQUIPMENT/FURNISHINGS

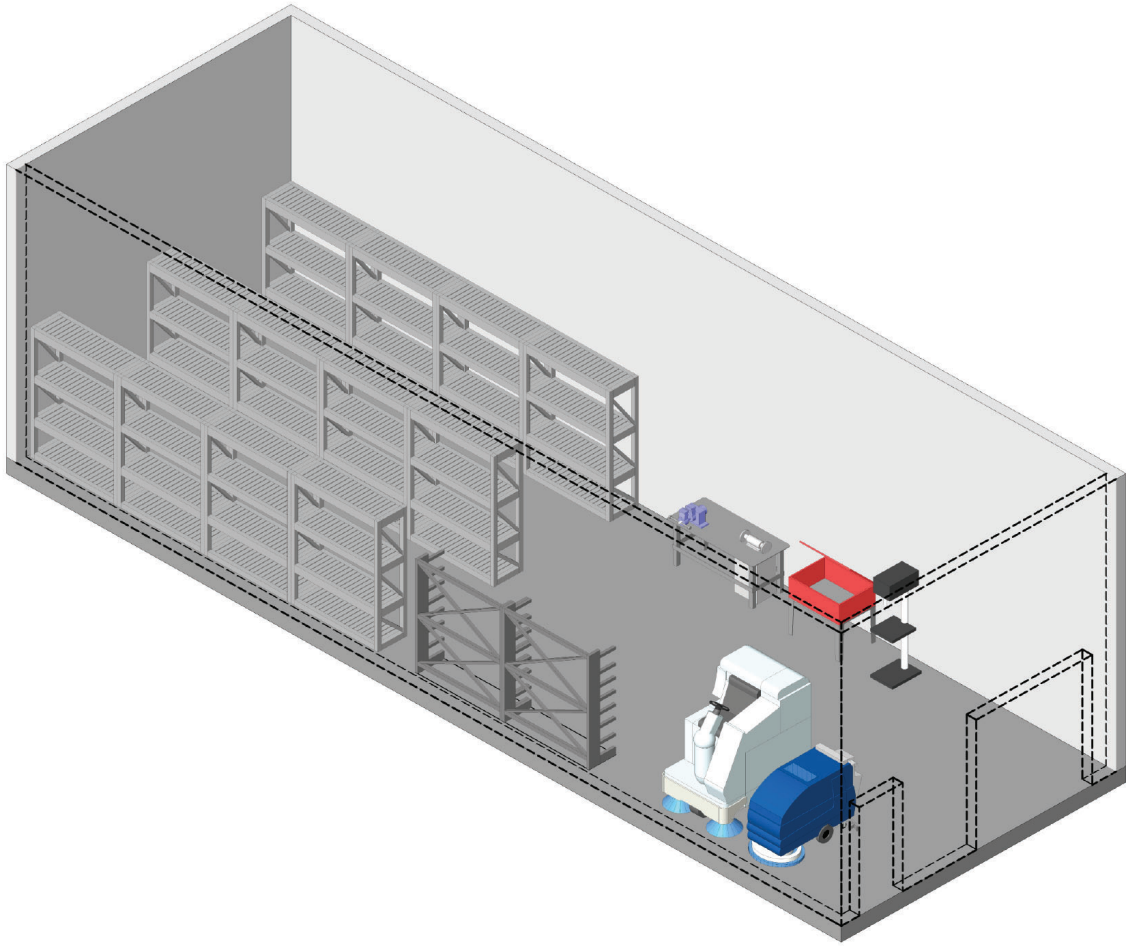
- Miscellaneous fitness equipment determined by the Owner
- Television

DESIGN FEATURES

- Architectural:
  - ✓ Floor: Athletic rubber floor tiles with base (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors: Single leaf 3'-0" doors
- Daylighting: Exterior window desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (25 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

BUILDING ENGINEER/BUILDING STORAGE





BUILDING ENGINEER/BUILDING STORAGE

FUNCTION

Enclosed, secure shop and materials storage and upkeep of materials related to maintenance buildings and site grounds.

RELATIONSHIP TO OTHER AREAS

- Access to all Restroom/Showers and Break/Crew Room

CRITICAL DIMENSIONS

- 14'-0" vertical clearance to structure and clearance

EQUIPMENT/FURNISHINGS

- Severe use workbench with vise
- Buffer/grinder
- Drill press
- Parts cleaning tank
- Shelving units
- Arm racks
- Floor scrubbers

DESIGN FEATURES

- Forklift access
- Electronically secured entry

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finish, made of concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities, light colored finish
- Doors:
  - ✓ Personnel door with view panel to meet applicable code exit requirements
  - ✓ Exterior overhead doors: High lifting sectional, steel, insulated, 10'-0" by 12'-0" with view panels. Automatic operator, interior and exterior push button controls with lockout on exterior
  - ✓ Bollards on exterior at jambs of overhead door (two each)

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)

MECHANICAL CONSIDERATIONS

- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- In-floor radiant heat (if desired)
- As required by equipment

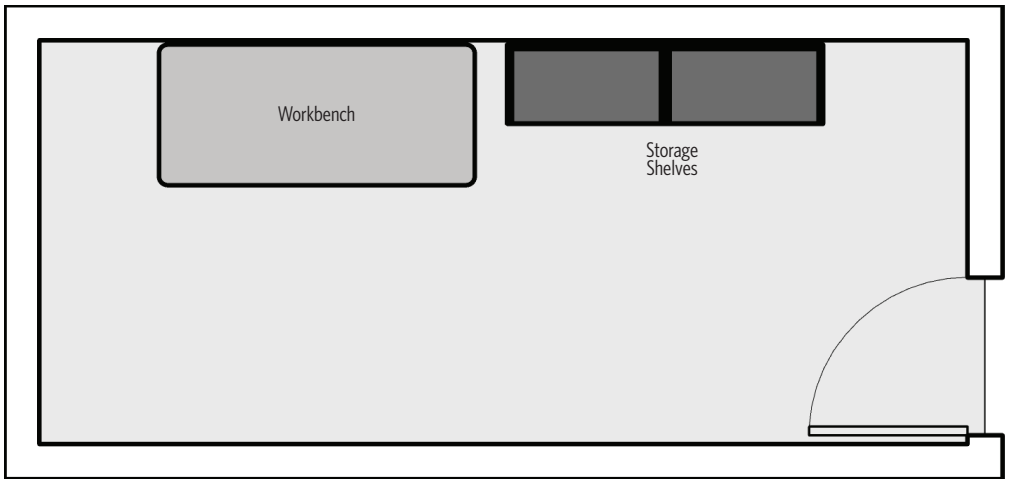
PLUMBING CONSIDERATIONS

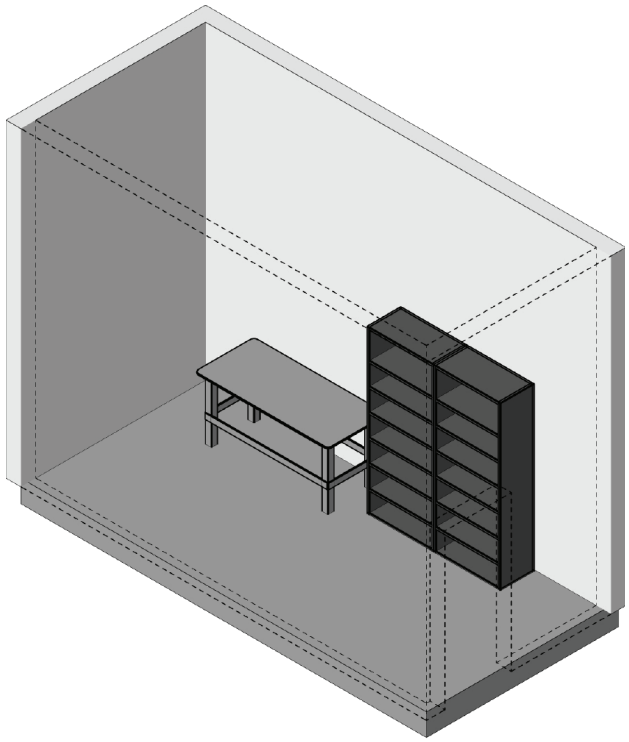
- Compressed air drop:
  - ✓ 2'-0" compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (20 fc average)
  - ✓ Fixtures located to illuminate work spaces
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

REVENUE OFFICE





FUNCTION

Secure area for storing specialized tools and equipment for fare retrieval, adaptable with space for workstation.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Meet & Greet at entrance

CRITICAL DIMENSIONS

- 12'-0" vertical clearance to structure and fixtures

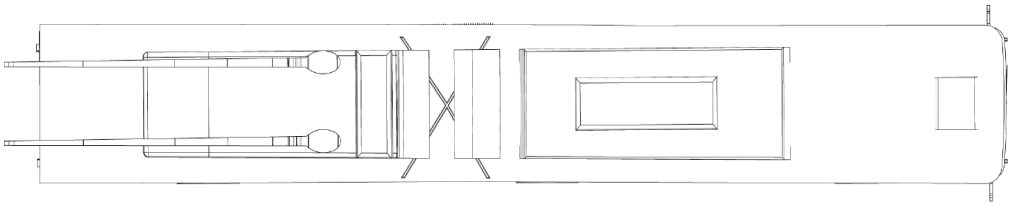
EQUIPMENT/FURNISHINGS

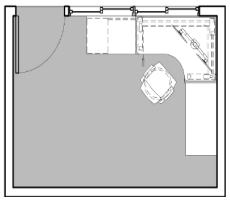
- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

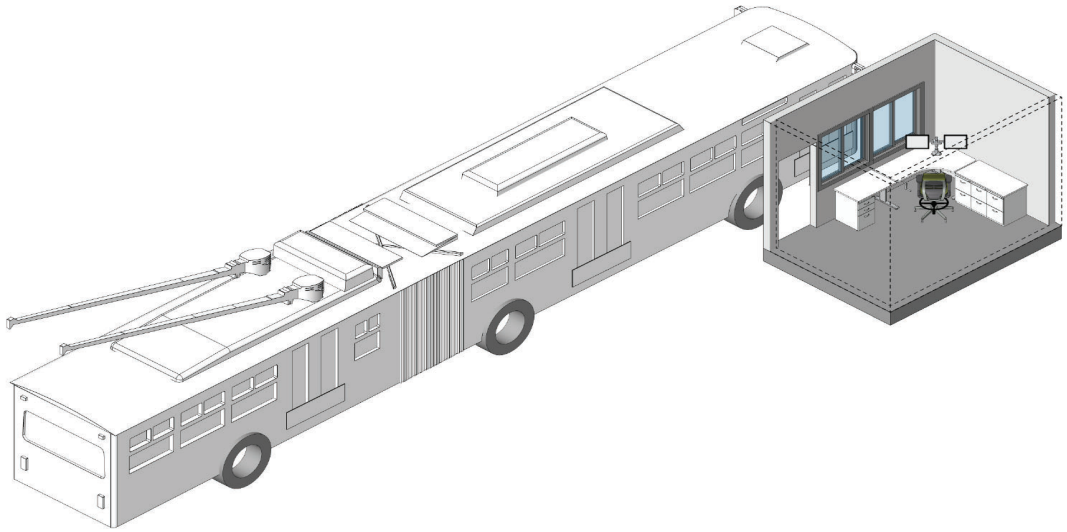
DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Soil, grease, water, slip resistant concrete, with integral non-metallic light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities, with light colored finish
  - ✓ Doors: Personnel door with view panels to meet applicable code exit requirements (not required with wire mesh walls)
- Structural:
  - ✓ Control joints in floor slab at adequate spacing
  - ✓ Floor slab to accommodate in-floor radiant heat (if desired)
  - ✓ Structure as needed to support equipment
  - ✓ Floor slab designed to accommodate forklift access
- Mechanical:
  - ✓ In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ As required by equipment
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting: LED lighting in accordance with IES recommendation minimum (20 fc average)

MEET & GREET







FUNCTION

Space for buses to be greeted as they enter the facility.

RELATIONSHIP TO OTHER AREAS

- Adjacent to entrance of facility
- Buses will use circulation aisle to access Meet & Greet

CRITICAL DIMENSIONS

- 19’-0” vertical clearance (minimum)

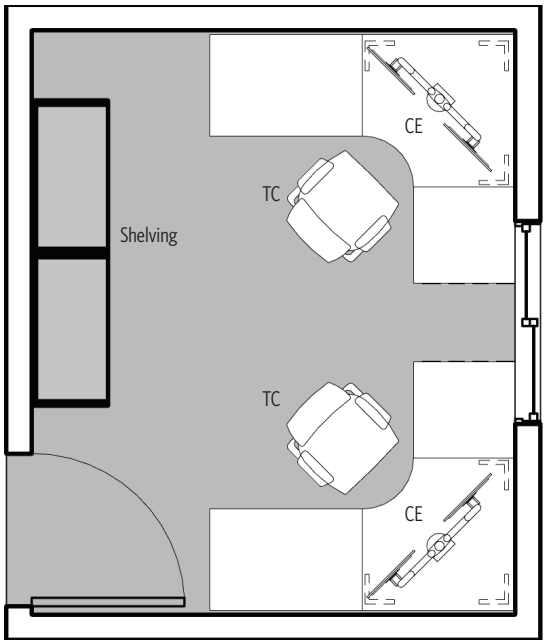
EQUIPMENT/FURNISHINGS

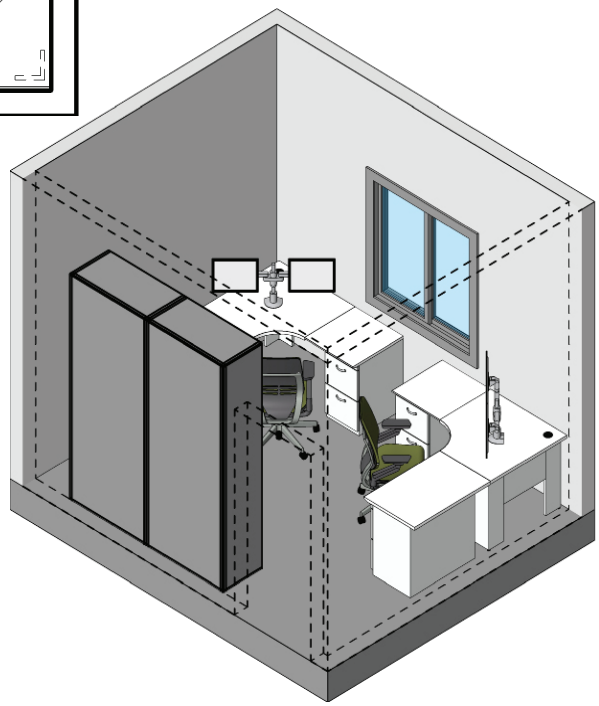
- Task chair
- Sit/stand workstation
- Under surface vertical files
- Cabinets
- Guest chairs

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring:
    - Carpet tile floor with rubber base for Administration or Operations areas (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
    - Resilient floor covering with base for maintenance areas (recommended).
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3’-0” door with loadable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (35 fc average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a quad receptacle at each workstation
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

SECURITY OFFICE





FUNCTION

Office for security staff to monitor facility.

RELATIONSHIP TO OTHER AREAS

- Case specific (office areas specific to each group); reference general module

CRITICAL DIMENSIONS

- 9’-0” vertical clearance (minimum)

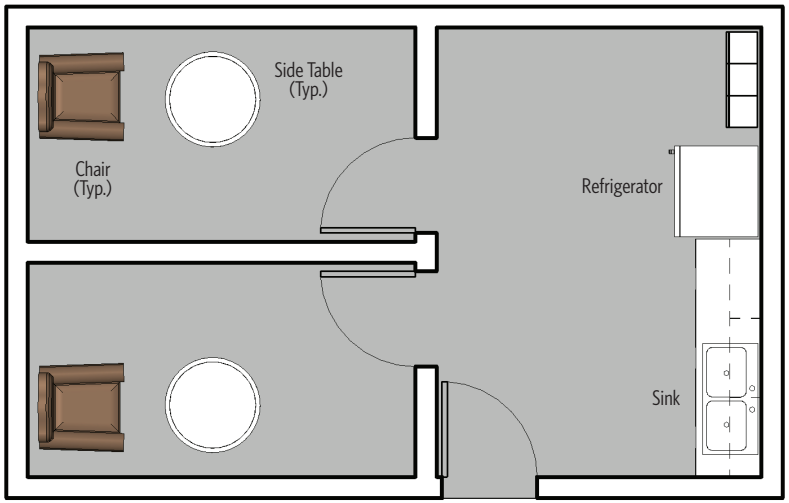
EQUIPMENT/FURNISHINGS

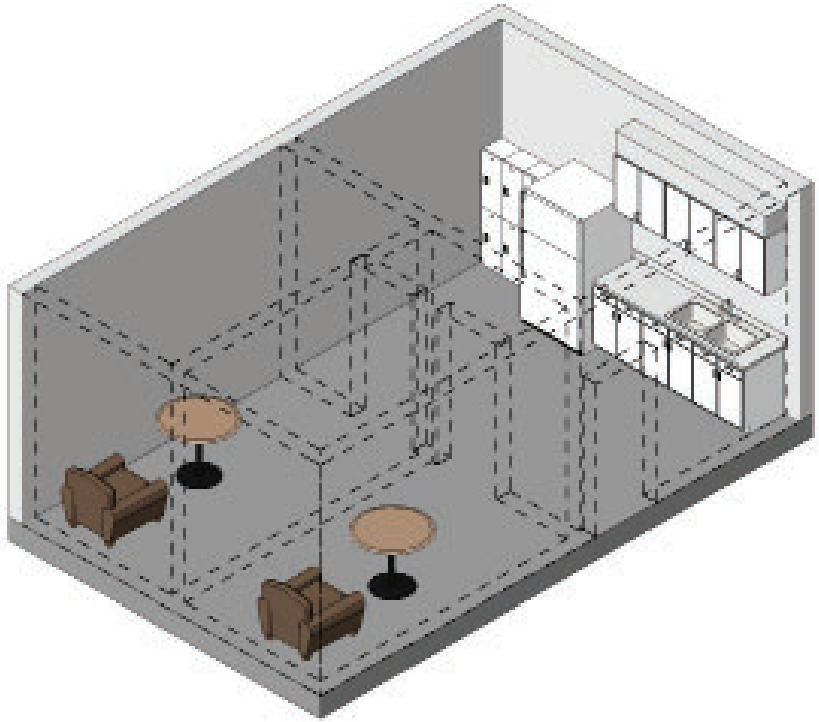
- Task chair
- Sit/stand workstation
- Under surface vertical files
- Cabinets
- Guest chairs

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring:
    - Carpet tile floor with rubber base for Administration or Operations areas (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
    - Resilient floor covering with base for maintenance areas (recommended).
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3’-0” door with loadable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (35 fc average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a quad receptacle at each workstation
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

LACTATION ROOM





FUNCTION

Dedicated room for employees who are breastfeeding to pump breast milk in private.

RELATIONSHIP TO OTHER AREAS

- Accessible from department office areas

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

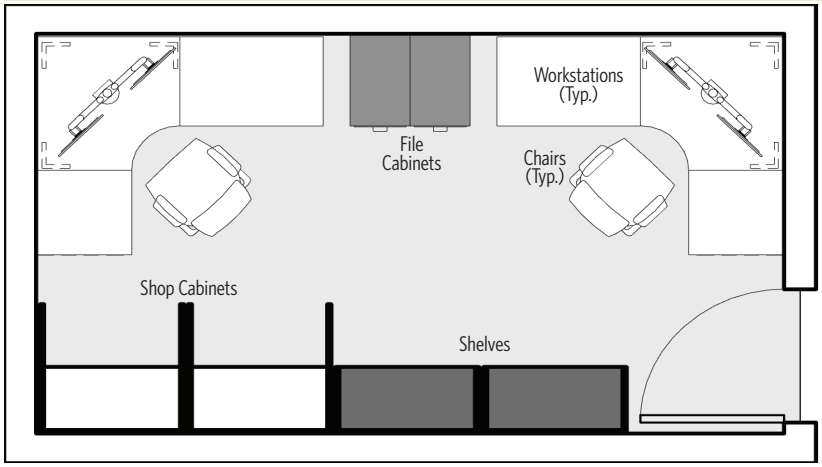
EQUIPMENT/FURNISHINGS

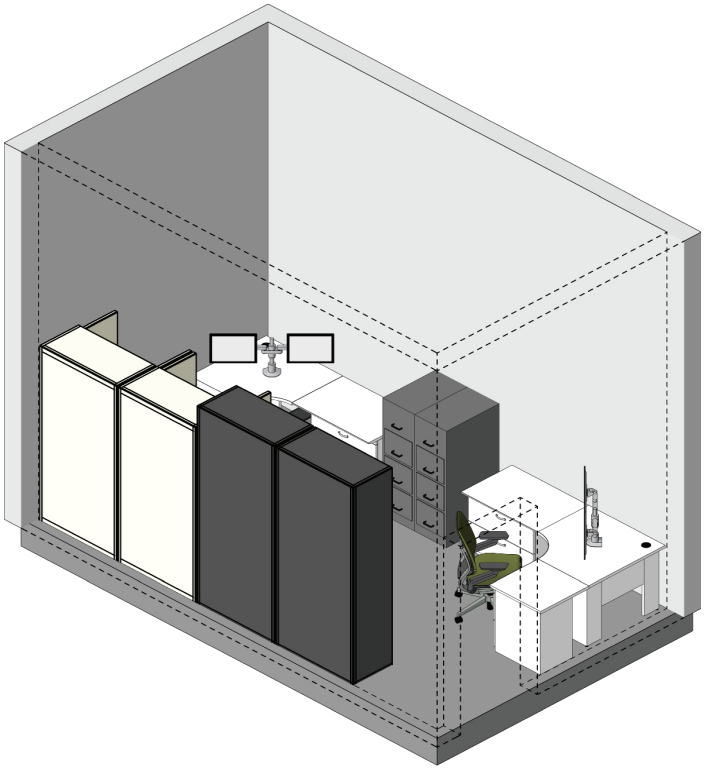
- Sink with countertops and cabinets
- Secure storage for equipment and supplies
- Lockers
- Side tables
- Refrigerator
- Chairs
- Door with interior lock

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf lockable 3'-0" door with loadable lever set hardware (recommended)
    - Electronically secured entry
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Plumbing: rough-in for fixtures
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc indirect lighting average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
  - ✓ Provide one GFCI outlet above counter
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

FACILITIES STATIONARY ENGINEER OFFICE/SHOP





FUNCTION

Workstations, Shop and Storage for Facilities Stationary Engineering staff.

RELATIONSHIP TO OTHER AREAS

- Access to Parts Window/Shopkeeper/Parts Storage/ Shipping and Receiving/ Dock

CRITICAL DIMENSIONS

- 12’-0” vertical clearance to structure and fixtures

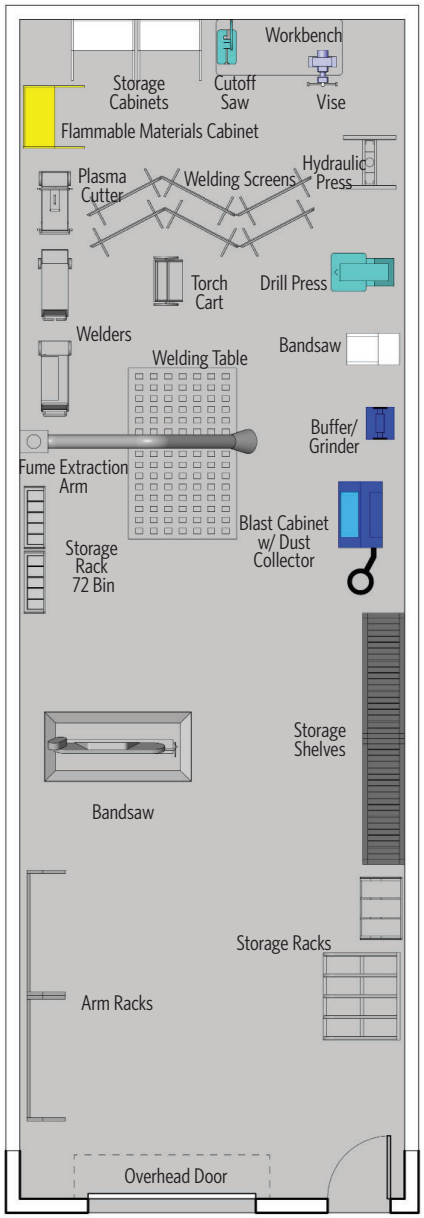
EQUIPMENT/FURNISHINGS

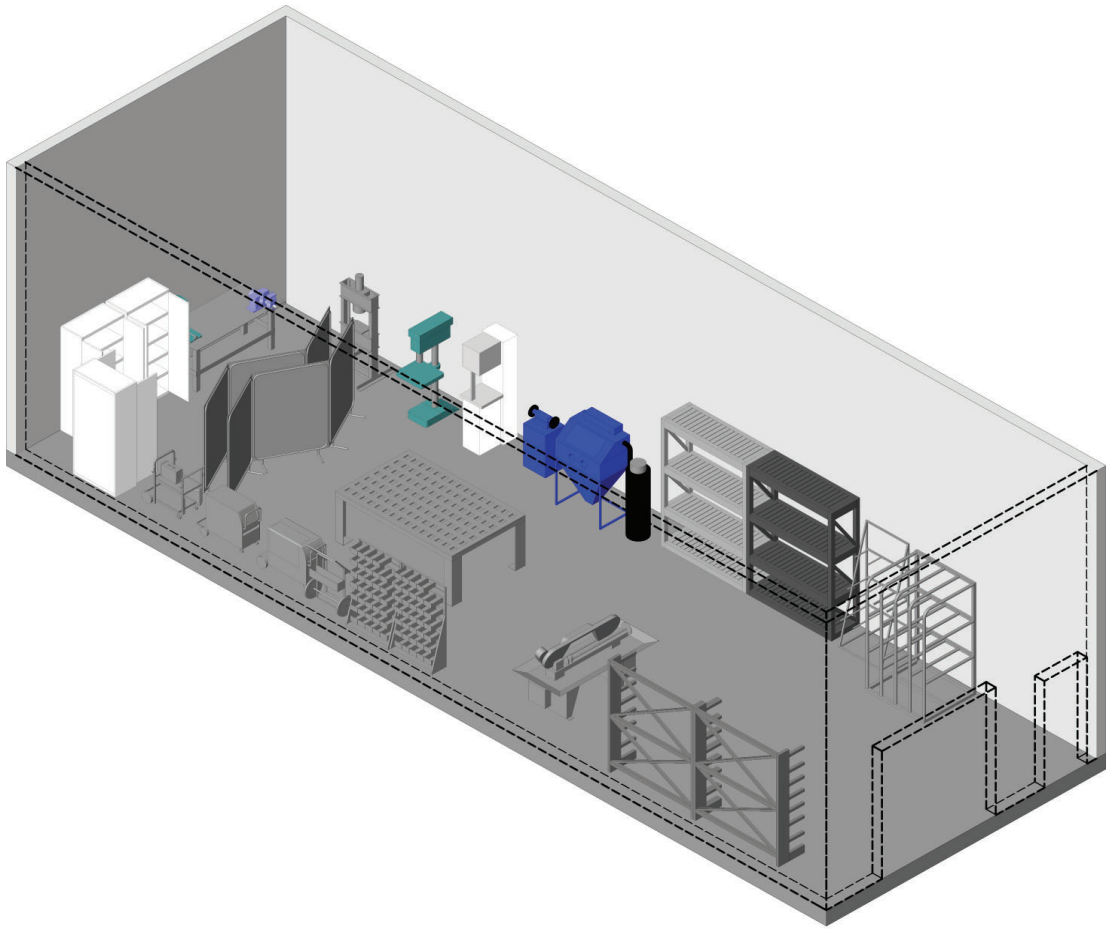
- Typical equipment is shown, reference Appendix A: Equipment Manual for specific project equipment

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Soil, grease, water, slip resistant concrete, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish
  - ✓ Doors: Personnel door with view panels to meet applicable code exit requirements (not required with wire mesh walls)
- Structural:
  - ✓ Control joints in floor slab at adequate spacing
  - ✓ Floor slab to accommodate in-floor radiant heat (if desired)
  - ✓ Structure as needed to support equipment
  - ✓ Floor slab designed to accommodate forklift access
- Mechanical:
  - ✓ In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ As required by equipment
- Power:
  - ✓ All receptacles and outlets at 3’-6” AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting: LED lighting in accordance with IES recommendation minimum (20 fc average)

SHEET METAL SHOP





SHEET METAL SHOP

FUNCTION

Enclosed, secure shop and materials storage for metal fabrication.

RELATIONSHIP TO OTHER AREAS

- Adjacent to bus maintenance areas

CRITICAL DIMENSIONS

- 14’-0” vertical clearance to structure and clearance

EQUIPMENT/FURNISHINGS

- Reference Equipment Manual

DESIGN FEATURES

- Forklift access
- Electronically secured entry

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral, non-metallic, light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, with light colored finish, made of concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit, and utilities, light colored finish
- Doors:
  - ✓ Personnel door with view panel to meet applicable code exit requirements
  - ✓ Exterior overhead doors: High lifting sectional, steel, insulated, 10’-0” by 12’-0” with view panels. Automatic operator, interior and exterior push button controls with lockout on exterior
  - ✓ Bollards on exterior at jambs of overhead door (two each)

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accommodate in-floor radiant heat (if desired)

MECHANICAL CONSIDERATIONS

- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- In-floor radiant heat (if desired)
- As required by equipment

PLUMBING CONSIDERATIONS

- Compressed air drop:
  - ✓ 2’-0” compressed air piping loop (minimum)
  - ✓ Compressed air drops with shut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4’-0” AFF
  - ✓ Provide disconnects for 3/8” and 1/2” impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Power:
  - ✓ All receptacles and outlets at 3’-6” AFF
  - ✓ Provide general purpose duplex receptacles (ten minimum) on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Lighting:
  - ✓ LED lighting in accordance with IES recommendation minimum (20 fc average)
  - ✓ Fixtures located to illuminate work spaces
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

SECTION 5.11: TRAINING

GENERAL OFFICE MODULES

MANAGER

- Reference **Office Module Private Office - 224 sf**
- Adjacent to Superintendent
- Adjacent to Assistant Superintendent

SUPERINTENDENT

- Reference **Office Module Private Office - 224 sf**
- Adjacent to Manager
- Adjacent to Assistant Superintendent

ASSISTANT SUPERINTENDENT

- Reference **Office Module Private Office - 120 sf**
- Adjacent to Manager
- Adjacent to Superintendent

SUPERVISOR

- Reference **Office Module Workstation - 64 sf**
- Adjacent to Verification of Transit Training
- Adjacent to Instructors

CLERICAL STAFF

- Reference **Office Module Workstation - 64 sf**
- Adjacent to Team Leaders

TEAM LEADERS

- Reference **Office Module Workstation - 64 sf**
- Adjacent to Clerical Staff

CAT TRAINING

- Reference **Office Module Workstation - 64 sf**
- Adjacent to Supervisors

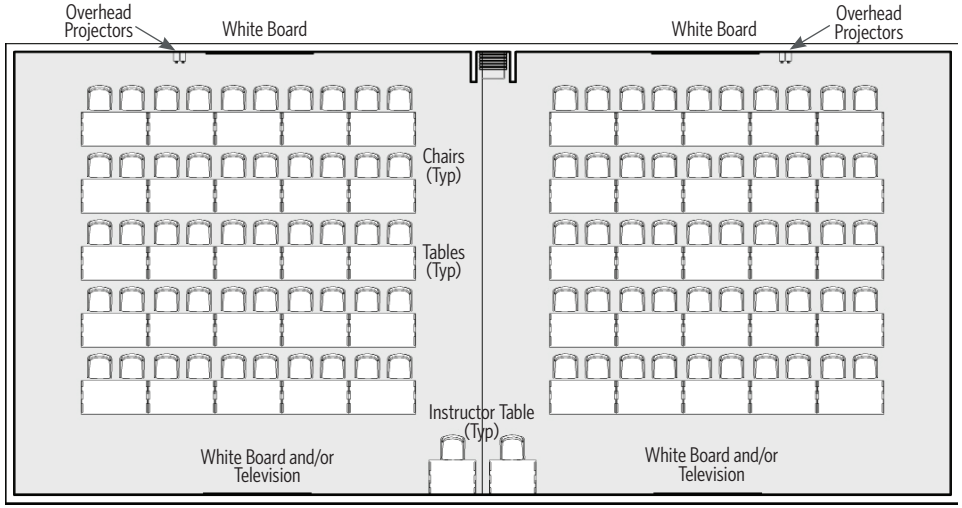
INSTRUCTORS

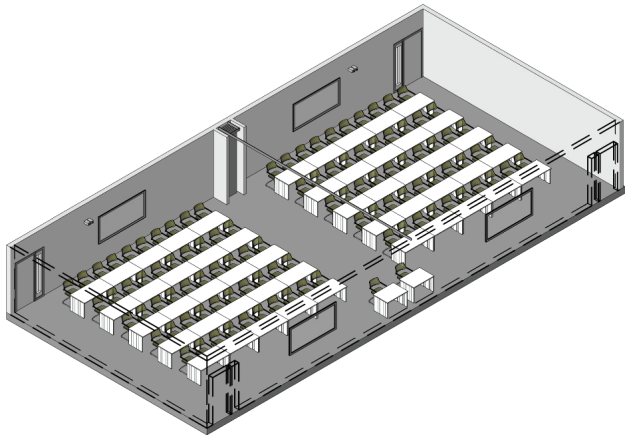
- Reference **Office Module Workstation - 30 sf**
- Adjacent to Training Room
- Adjacent to Classroom

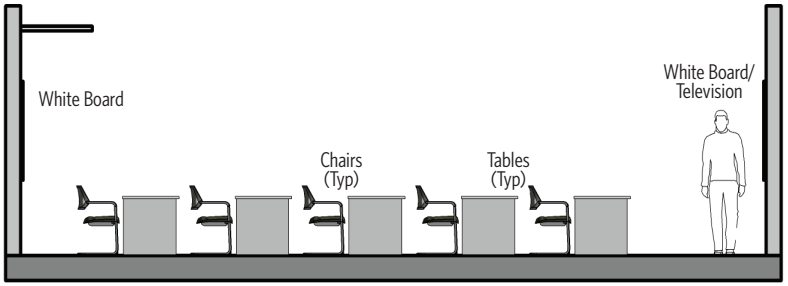
IT OFFICE

- Reference **Office Module Private Office - 120 sf**
- Adjacent to Computer Lab

CLASSROOM A & B







FUNCTION

Large room(s) for staff training activities. Each space shall accommodate 50 students separately, 100 when combined. Classrooms A & B can be divided or joined via folding partition wall.

RELATIONSHIP TO OTHER AREAS

- Accessible to all departments in the building
- Adjacent to Training Office area

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

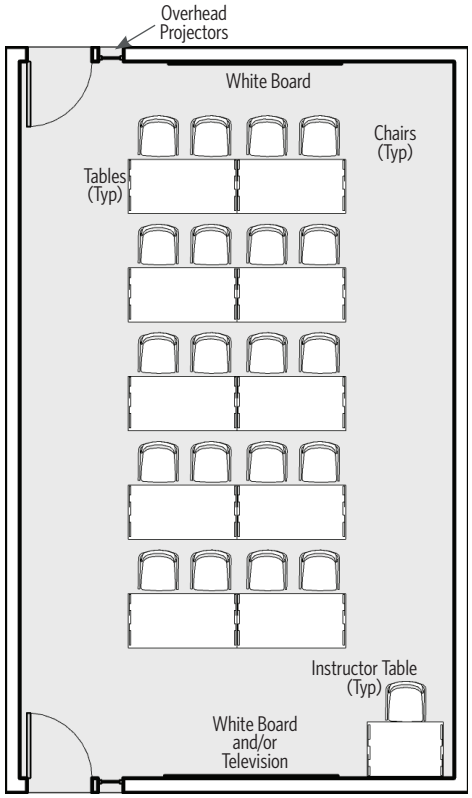
EQUIPMENT/FURNISHINGS

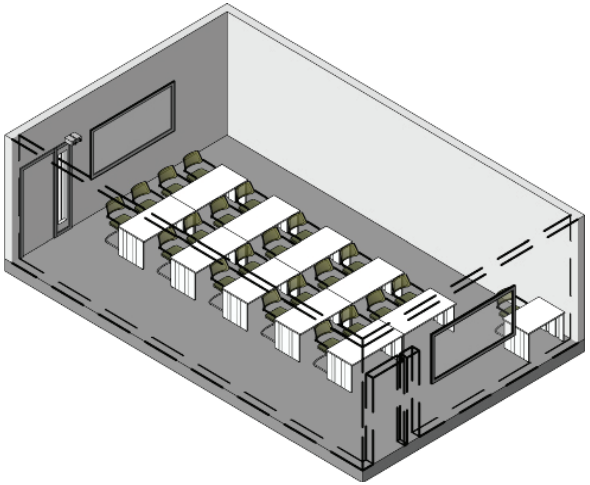
- Mayline Cohere Flip/nest table 60" by 30" laminate
- Cool mesh nesting chairs
- Whiteboard and/or television
- Overhead projectors

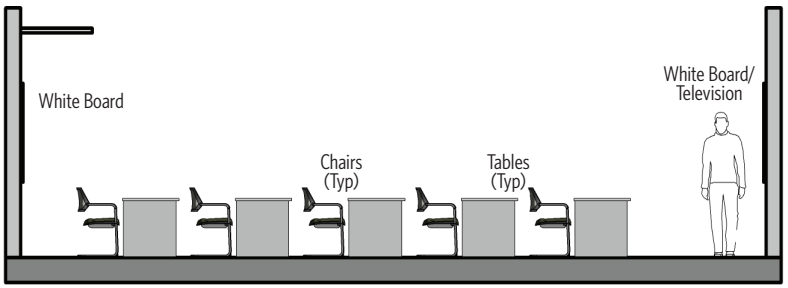
DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Provide CO2 detection
- Power:
  - ✓ LED lighting in accordance with IES recommendations (35 fc average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and one inch or larger conduit rough-ins every ten feet in all walls in room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

CLASSROOM C & D







FUNCTION

Room(s) for staff training. This space accommodates 20 students and one instructor.

RELATIONSHIP TO OTHER AREAS

- Accessible to all departments in the building
- Adjacent to Training Office area

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

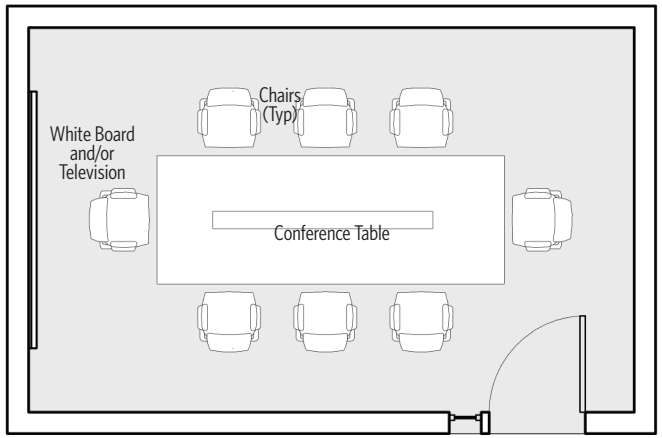
EQUIPMENT/FURNISHINGS

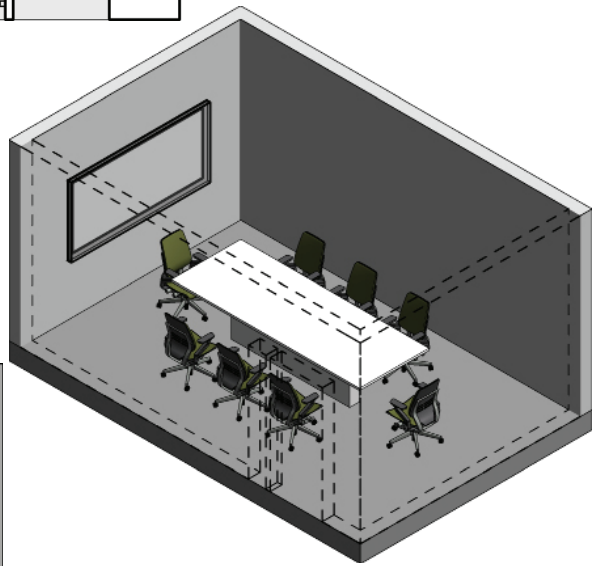
- Mayline Cohere Flip/nest table 60" by 30" laminate
- Cool mesh nesting chairs
- Whiteboard and/or television
- Overhead projector

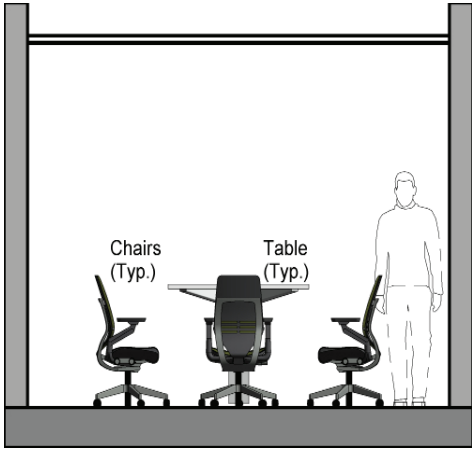
DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - ○ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - ○ Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - ○ Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - ○ Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Provide CO2 detection
- Power:
  - ✓ LED lighting in accordance with IES recommendations (35 fc average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and one inch or larger conduit rough-ins every ten feet in all walls in room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

CONFERENCE ROOM A & B







FUNCTION

Room to accommodate up to 10 people for meetings.

RELATIONSHIP TO OTHER AREAS

- Accessible from all departments in the building

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

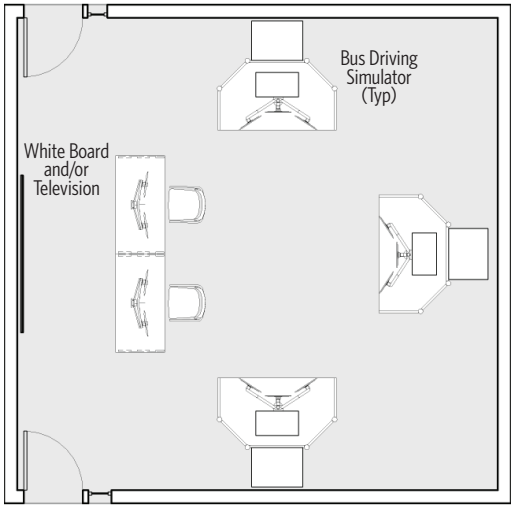
EQUIPMENT/FURNISHINGS

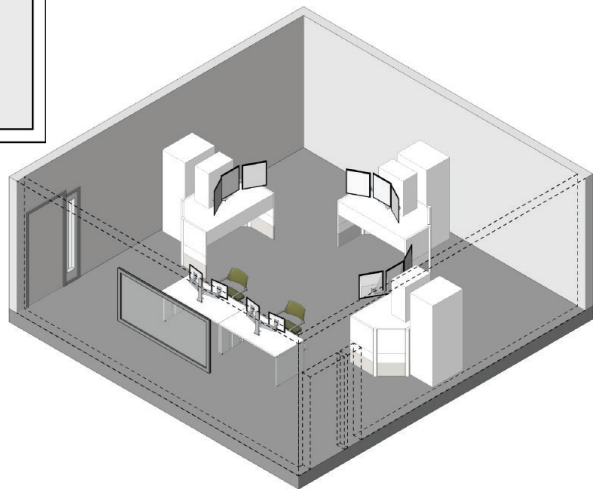
- Table
- Chairs
- White board and/or television
- Millwork

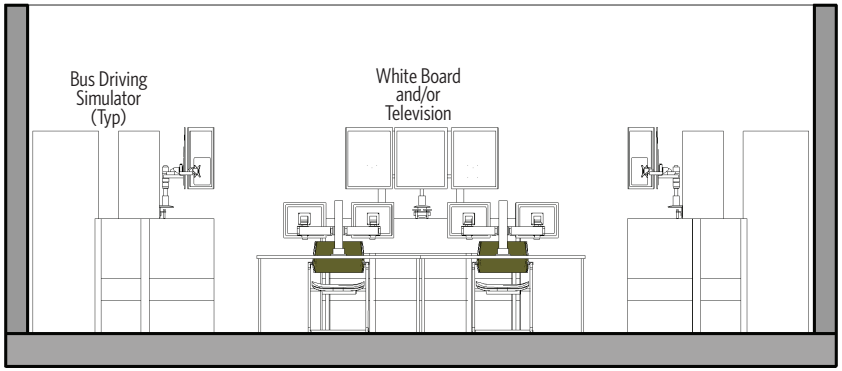
DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED lighting in accordance with IES recommendations (30 fc average)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in the room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

SIMULATOR ROOM







FUNCTION

Room for computer-based simulator training for staff.

RELATIONSHIP TO OTHER AREAS

- Accessible to all departments in the building
- Adjacent to Training Office area

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

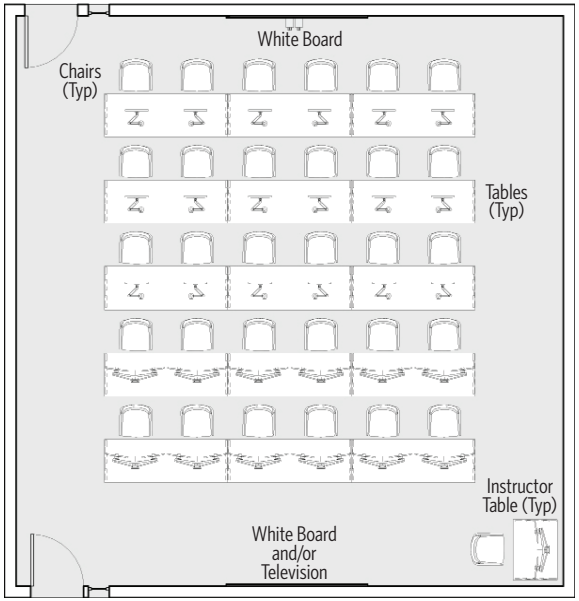
EQUIPMENT/FURNISHINGS

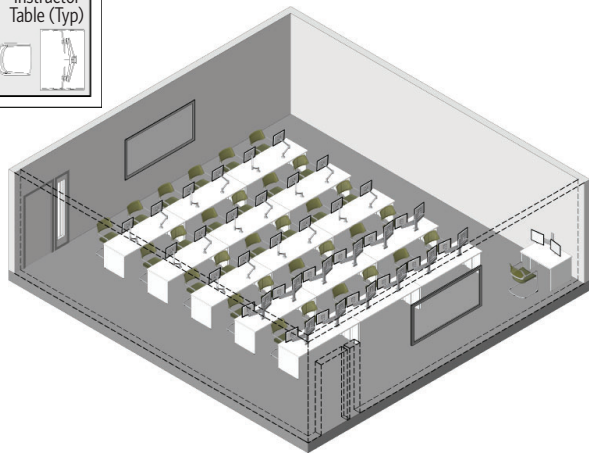
- Simulators
- Whiteboard and/or television

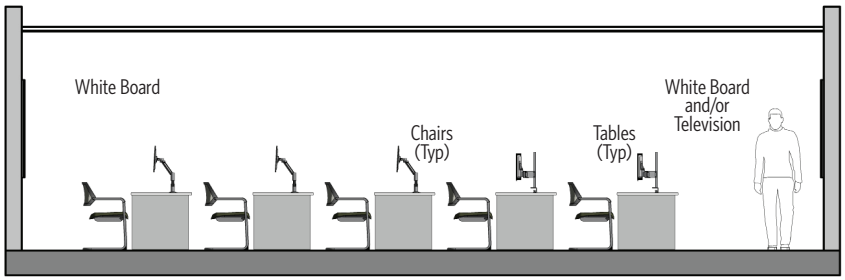
DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED lighting in accordance with IES recommendations. (20 fc indirect lighting average) (no glare)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in the room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

COMPUTER LAB







FUNCTION

Room for computer-based training activities.

RELATIONSHIP TO OTHER AREAS

- Accessible from all departments in the building
- Adjacent to Training Office areas

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

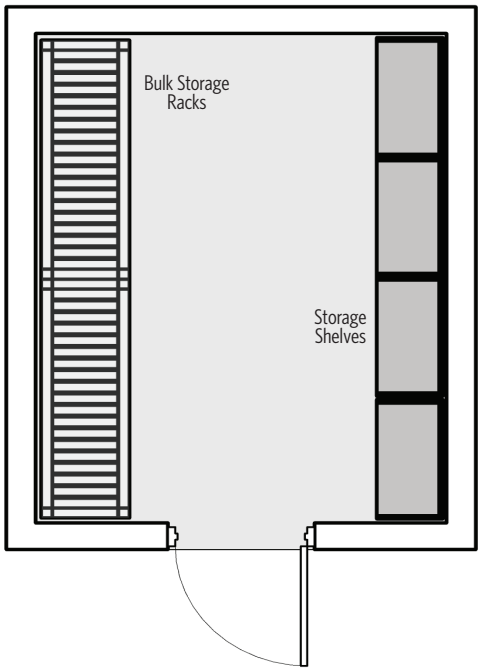
EQUIPMENT/FURNISHINGS

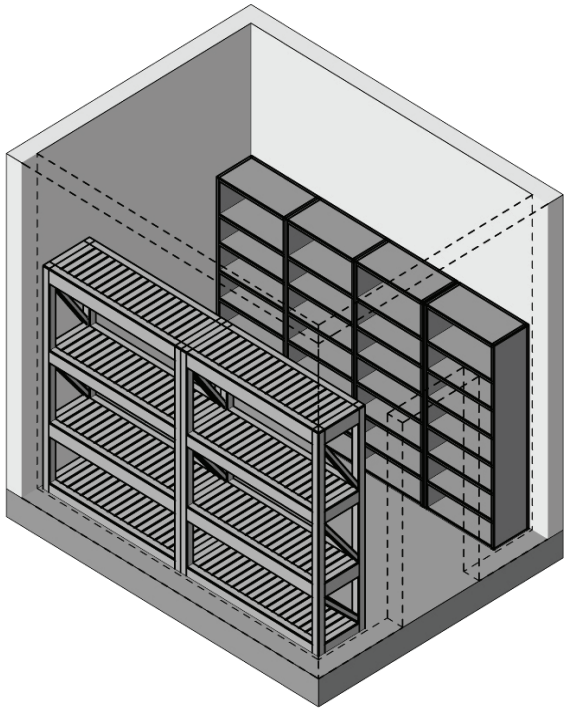
- Mayline Cohere Flip/nest table 60" by 30" laminate
- Cool mesh nesting chairs
- Whiteboard and/or television
- Computers
- Overhead projector

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Carpet tile floor with rubber base or resilient floor covering with base (recommended). Carpet tile must comply with the specifications developed by the San Francisco Department of the Environment, dated June 8, 2018
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Provide CO2 detection
- Power:
  - ✓ LED lighting in accordance with IES recommendations. (20 fc indirect lighting average) (no glare)
  - ✓ Provide general purpose duplex receptacles (four minimum) and a guard receptacle in the floor under the middle of each of the tables
  - ✓ Provide one data outlet with four data ports in the floor under the middle of each table
  - ✓ Provide box and one inch or larger conduit rough-ins every ten feet in all walls in room
- Lighting:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

HANDOUTS STORAGE





FUNCTION

Secure room for storage of training handout materials and supplies.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Classroom and Computer Lab

CRITICAL DIMENSIONS

- 9’-0” vertical clearance (minimum)

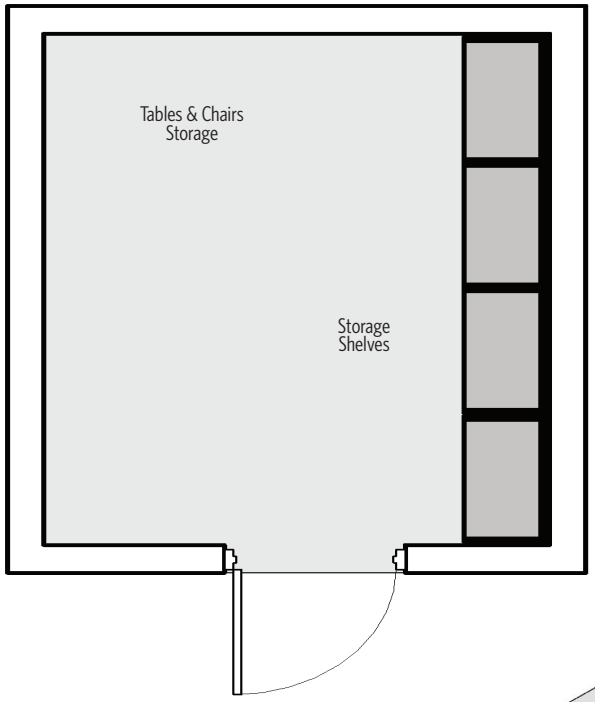
EQUIPMENT/FURNISHINGS

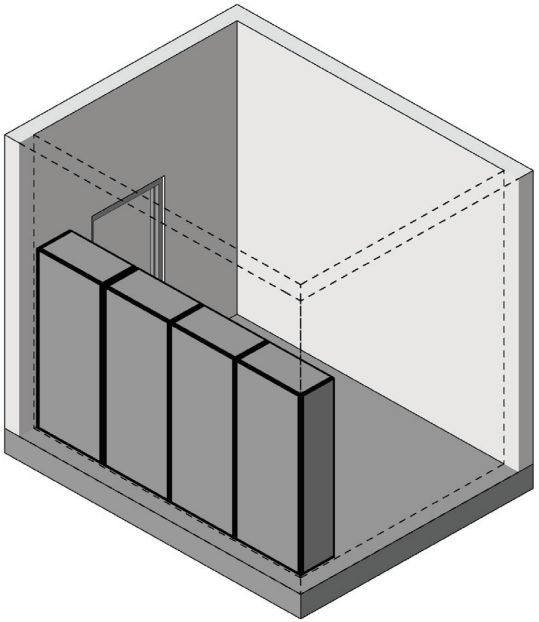
- Shelving
- Racking

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 3’-0” door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: No exterior exposure
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Keep consistent humidity levels
- Power:
  - ✓ LED lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensors

TRAINING AID STORAGE





FUNCTION

Secure room for storage of training aid materials and supplies.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Classroom and Computer Lab

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

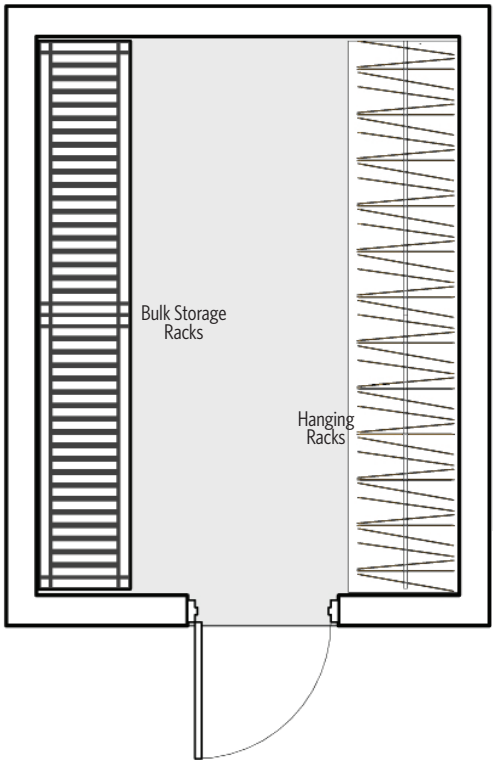
EQUIPMENT/FURNISHINGS

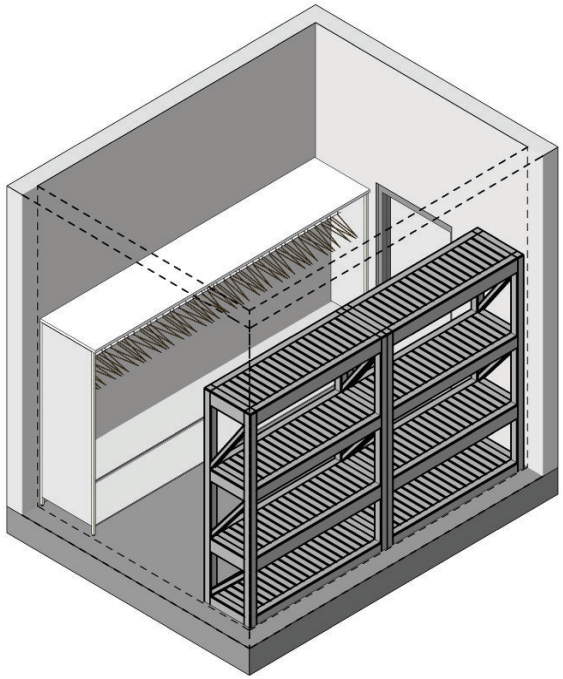
- Shelves
- Includes Tables and Chairs storage (as needed)

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 4'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: No exterior exposure
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Keep consistent humidity levels
- Power:
  - ✓ LED lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensors

UNIFORM STORAGE





FUNCTION

Enclosed room for storage of operator uniforms and safety attire.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Training Office areas

CRITICAL DIMENSIONS

- 9’-0” vertical clearance (minimum)

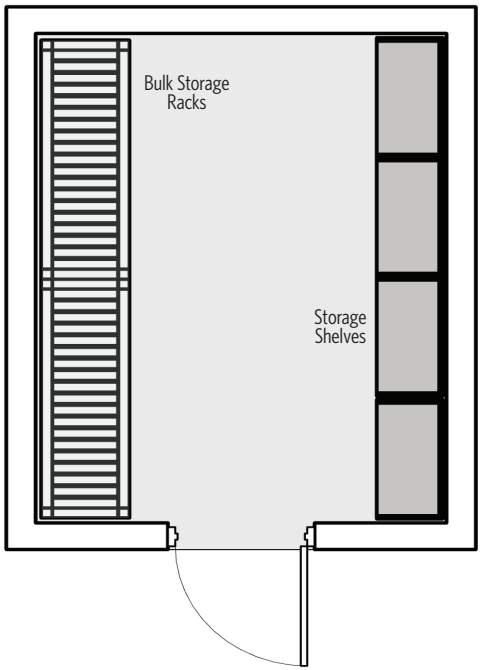
EQUIPMENT/FURNISHINGS

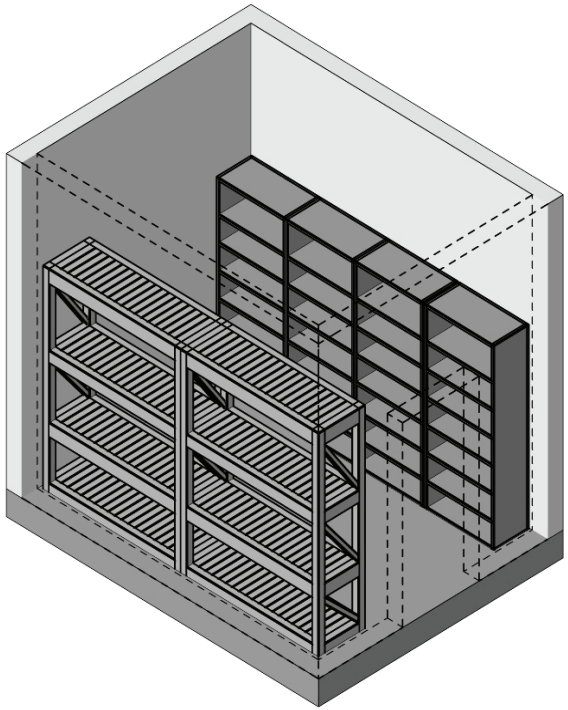
- Hanging racks
- Bulk storage racks

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 3’-0” door with loadable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED lighting in accordance with IES recommendation (15 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensor

RECORDS STORAGE





FUNCTION

Secure area for the storage of files and records.

RELATIONSHIP TO OTHER AREAS

- N/A

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

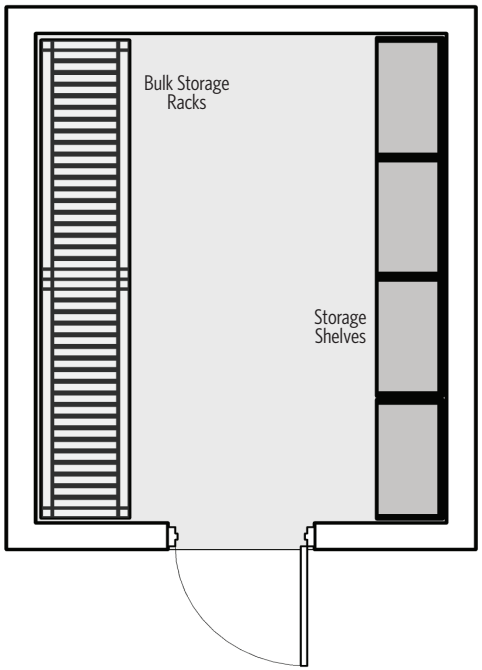
EQUIPMENT/FURNISHINGS

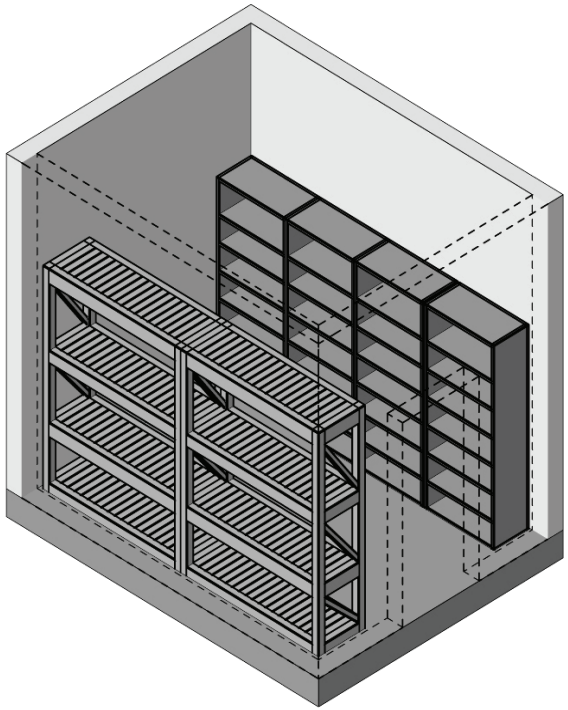
- Shelving
- Racking

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 3'-0" door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: No exterior exposure
- Plumbing: Rough in for equipment
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Keep consistent humidity levels
- Power:
  - ✓ LED lighting in accordance with IES recommendation (35 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensors

RECORDS ARCHIVE STORAGE





FUNCTION

Secure area for the long term storage of archived files and records.

RELATIONSHIP TO OTHER AREAS

- N/A

CRITICAL DIMENSIONS

- 9’-0” vertical clearance (minimum)

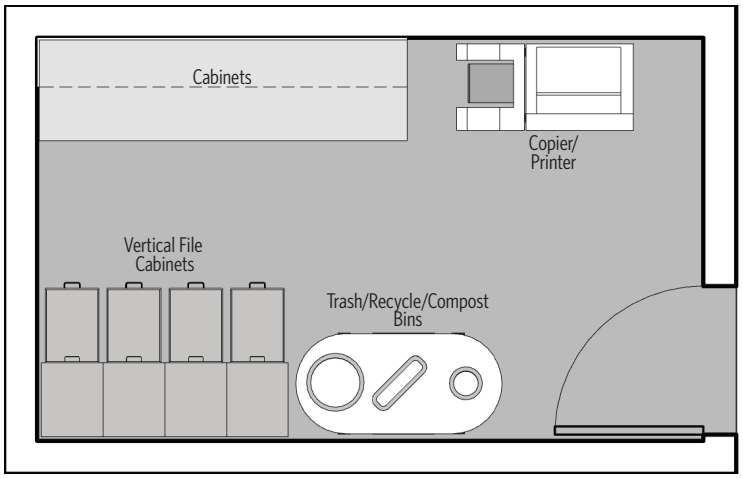
EQUIPMENT/FURNISHINGS

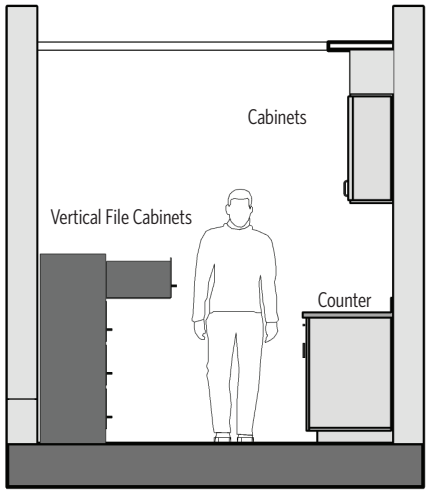
- Shelves
- Racks

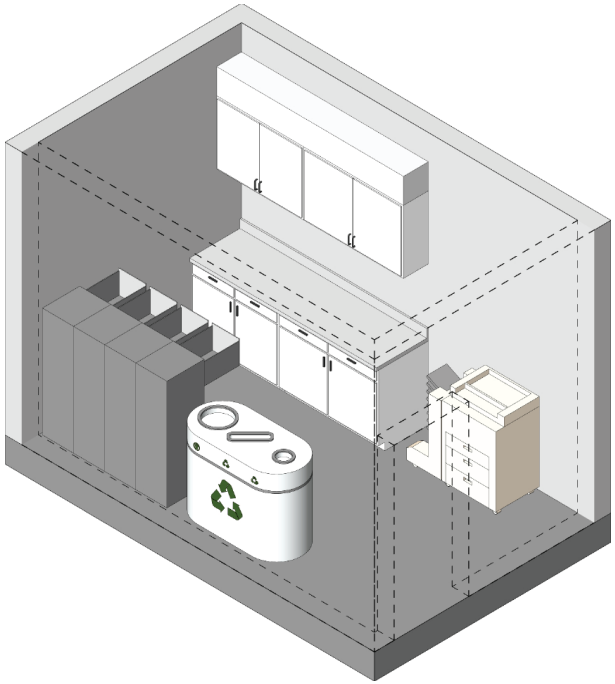
DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors:
    - Single leaf 3’-0” door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: No exterior exposure
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Keep consistent humidity levels
- Power:
  - ✓ LED lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
- Lighting: Dimmable, indirect lighting with occupancy sensors

COPY/SUPPLY







FUNCTION

Dedicated alcove or room for copier/printer/scanner/fax machine, storage for office supplies, and work surface.

RELATIONSHIP TO OTHER AREAS

- Access to all office areas

CRITICAL DIMENSIONS

- 9’ -0” vertical clearance (minimum)

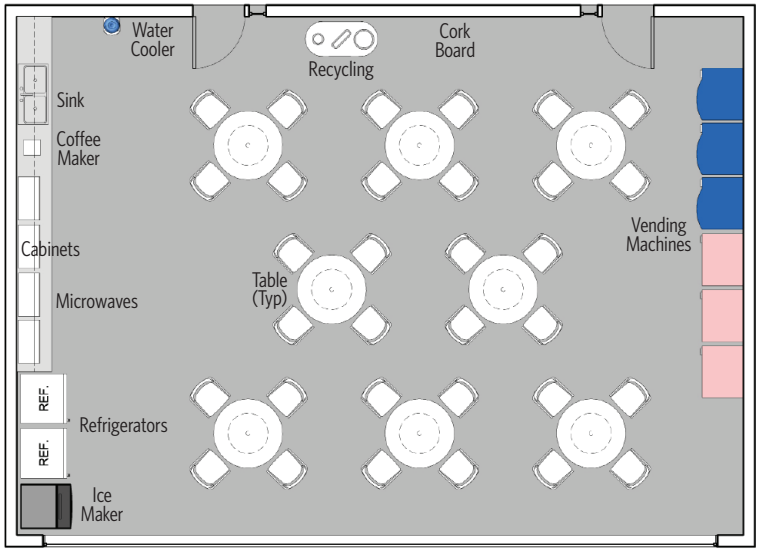
EQUIPMENT/FURNISHINGS

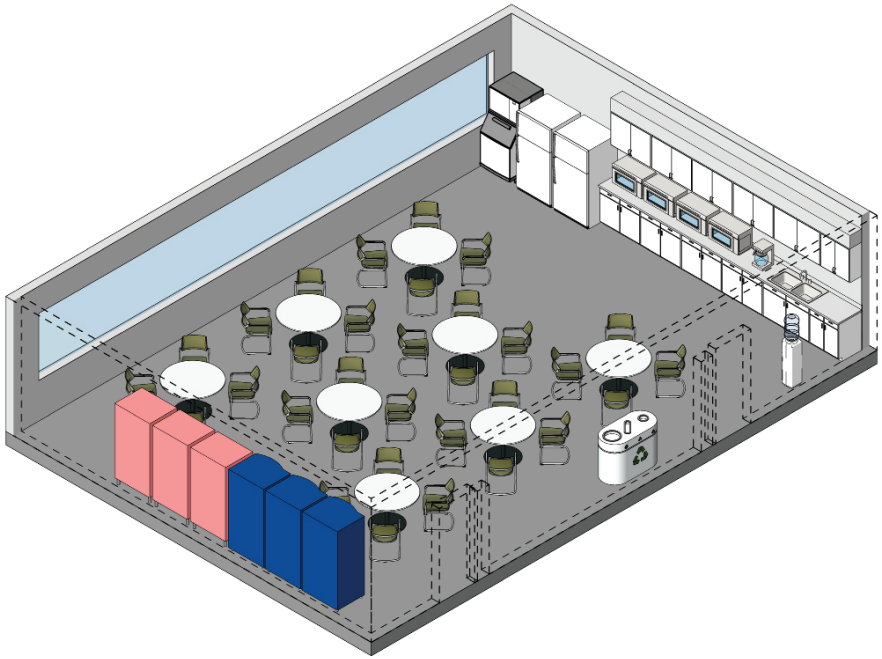
- Copier/printer/scanner/fax machine
- Work surface with cabinets below and above
- Filing cabinets
- Trash/recycling/compost bins
- Millwork

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3’-0” door with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
  - ✓ Provide one data outlet with four data ports
  - ✓ Provide box and one inch or larger conduit rough-ins to three other locations in the room
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

BREAK ROOM/KITCHENETTE/VENDING





FUNCTION

Enclosed room for use as a break area for training staff.

RELATIONSHIP TO OTHER AREAS

- Access from all Training Office areas

CRITICAL DIMENSIONS

- 9’ -0” vertical clearance (minimum)

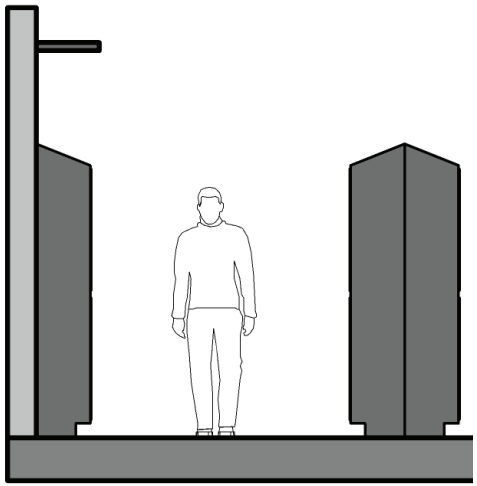
EQUIPMENT/FURNISHINGS

- Counter space, upper and lower cabinets, sink, microwaves, refrigerators, vending machines, water coolers, ice maker, water filter, coffee maker, tables, chairs, trash/recycling/compost bins
- Millwork

DESIGN FEATURES

- Architectural:
  - ✓ Furniture: Use owner furniture standards (if applicable)
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf 3’-0” doors (two minimum) with lockable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Daylighting: Exterior window desired
- Plumbing: Rough-in for fixtures
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Provide CO2 detection
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
  - ✓ Provide five GFCI outlets above kitchenette counter
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

OPERATOR LOCKERS



FUNCTION

Co-ed locker room with private changing areas and locker space for Operators to store personal gear and clothing.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Break Room/Kitchenette/Vending
- Adjacent to Men's and Women's Restrooms

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

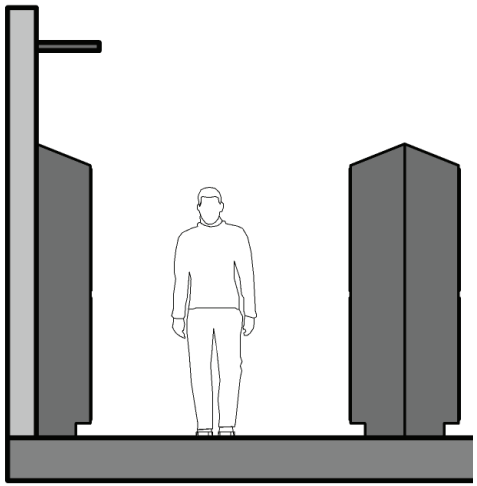
EQUIPMENT/FURNISHINGS

- Heavy duty, two tier, 3'-0", well-ventilated, slant top, half-height lockers; one each per Operator assigned to the facility

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering or finished concrete (recommended)
  - ✓ Walls:
    - Tile covering or painted masonry (recommended)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors: Single leaf 3'-0" door
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating, ventilation, and exhaust (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

INSTRUCTOR LOCKER



FUNCTION

Co-ed locker room with private changing areas and locker space for Instructors to store personal gear and clothing.

RELATIONSHIP TO OTHER AREAS

- Adjacent to Break Room/Kitchenette/Vending
- Adjacent to Men's and Women's Restroom

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

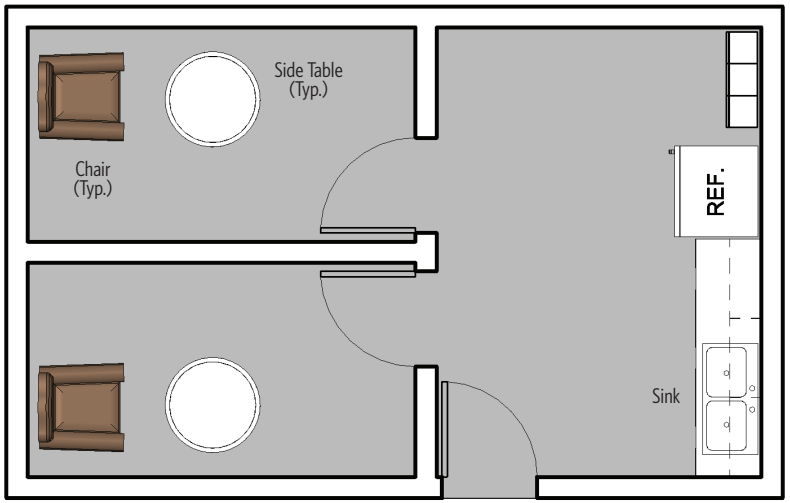
EQUIPMENT/FURNISHINGS

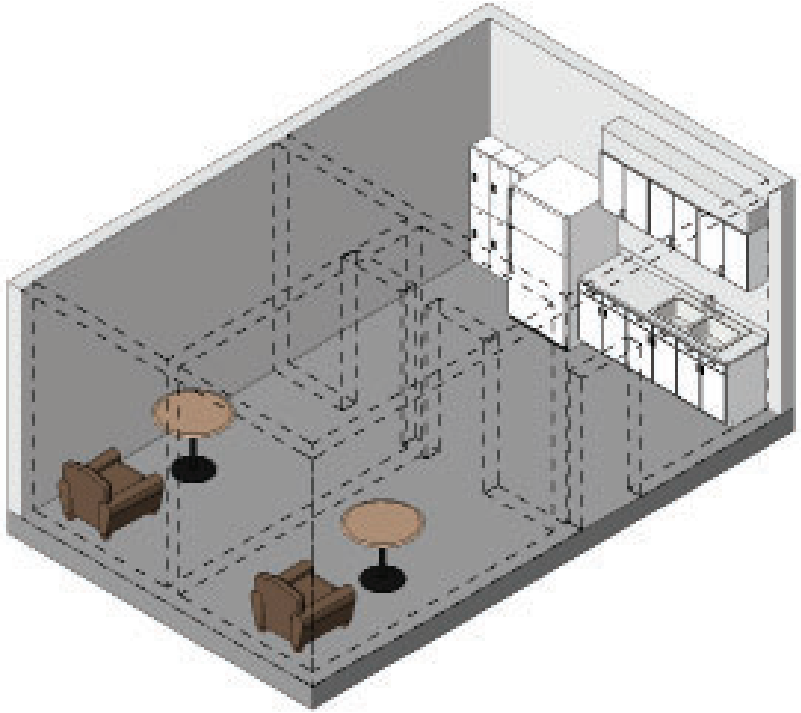
- Heavy duty, two tier, 3'-0", well-ventilated, slant top, half-height locker (one each per Instructor assigned to the facility)

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering or finished concrete (recommended)
  - ✓ Walls:
    - Tile covering or painted masonry (recommended)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
  - ✓ Doors: Single leaf 3'-0" door
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating, ventilation, and exhaust (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide general purpose duplex receptacles (six minimum)
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

LACTATION ROOM





FUNCTION

Dedicated room for personal privacy and storage or first aid supplies and personal care items.

RELATIONSHIP TO OTHER AREAS

- Accessible from department office areas

CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

EQUIPMENT/FURNISHINGS

- Sink with countertops and cabinets
- Secure storage for equipment and supplies
- Lockers
- Side tables
- Refrigerator
- Chairs

DESIGN FEATURES

- Architectural:
  - ✓ Flooring: Resilient floor covering with base or finished concrete (recommended)
  - ✓ Walls:
    - Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
    - Wall protection as needed
  - ✓ Ceiling: Acoustical ceiling tile (recommended)
  - ✓ Doors:
    - Single leaf lockable 3'-0" door with loadable lever set hardware (recommended)
    - Electronically secured entry (as required)
- Plumbing: rough-in for fixtures
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Power:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc indirect lighting average)
  - ✓ Provide general purpose duplex receptacles (three minimum)
  - ✓ Provide one GFCI outlet above counter
- Lighting:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

APPENDIX A:
MAINTENANCE EQUIPMENT MANUAL

Introduction

Overview

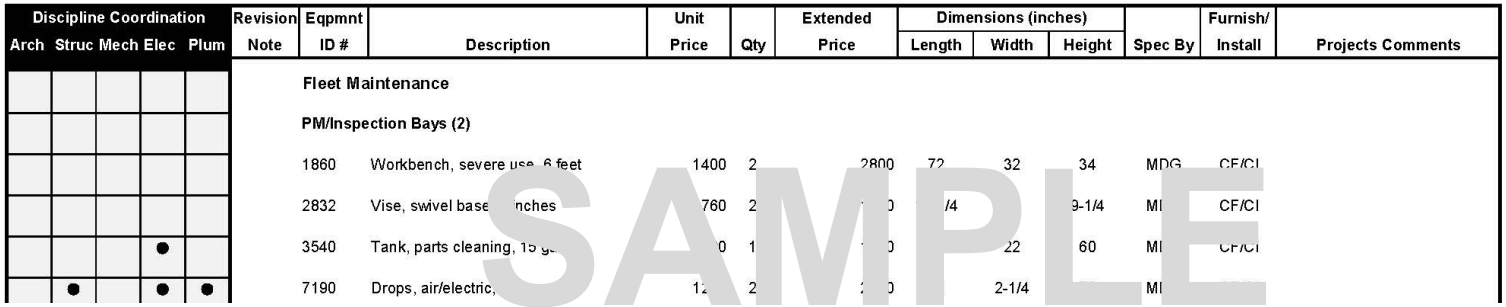
The equipment listed in the Equipment List, Datasheets, and Cutsheets is the minimum expectation of the SFMTA for the purpose of the RFP. If SFMTA wishes to require a higher standard of equipment during the PDA phase, then that would be negotiated at that time. The purpose of this document is to reflect the preferences of the SFMTA and provide a high level of detail so that there may be clear expectations on the part of all parties for the type of equipment that is expected and the associated budget. This Appendix was commissioned by the SFMTA in fall of 2018, and it builds on the equipment narrative and strengths and weaknesses discussion in Section 4 of the Design Criteria Document. This Appendix includes:

- Introduction
- Equipment List- organized from low to high equipment ID number.
- Equipment Datasheets
- Equipment Cutsheets

These minimum requirements are based on existing equipment and potential equipment acquisitions. Maintenance equipment described in this Manual represents the needs of each functional area of the facility based on discussions with stakeholders.

Reference Appendix A.

Equipment List Definitions:



Discipline Coordination					Revision	Eqpmnt		Unit		Extended	Dimensions (inches)				Furnish/	
Arch	Struc	Mech	Elec	Plum	Note	ID #	Description	Price	Qty	Price	Length	Width	Height	Spec By	Install	Projects Comments
							Fleet Maintenance									
							PM/Inspection Bays (2)									
						1860	Workbench, severe use, 6 feet	1400	2	2800	72	32	34	MDG	CF/CI	
						2832	Vise, swivel base, inches	760	2	[illegible]	/4		9-1/4	MI	CF/CI	
				●		3540	Tank, parts cleaning, 15 g[illegible]	0	1	[illegible]		22	60	MI	CF/CI	
	●		●	●		7190	Drops, air/electric,	12	2	[illegible]			2-1/4	MI		

Category:	Description:
Discipline Coordination:	Identifies other design team disciplines requiring coordination to properly accommodate equipment items in the facility design. Refer to Datasheets for detailed coordination issues.
Equipment Identifier:	All identical equipment items are assigned the same number. The Equipment Identifier coordinates this list with equipment layout drawings, datasheets, and, cutsheets. New equipment items are indicated by a 4-digit Equipment Identifier and owner supplied items are indicated by a 5-digit Equipment Identifier number.
Item Description:	Description for equipment.
Quantity:	The number of equipment items located within the functional area is listed.
Price:	All pricing is list from the manufacturer.
Dimensions:	Overall equipment length, width, and height respectively, listed in inches unless otherwise noted.
Furnish/Install:	Recommends responsibility to furnish and install equipment.
CF/CI	Contractor to furnish and install, usually by bid package specifications for General Contractor installation.
OF/OI	Owner to furnish and install, usually smaller office and shop equipment normally purchased by owner. This also includes any items owner will provide.
Project Comments:	Includes special requirements and other relevant data to be considered during detailed design for the project.

Equipment Datasheets

The purpose of this document is to identify the various coordination issues and disciplines associated with the types of equipment recommended for facility operations. The Equipment Datasheets are for discipline coordination purposes only. Coordination issues are grouped per Equipment Datasheet according to the following disciplines:

- Architectural
- Structural
- Mechanical
- Electrical
- Plumbing

The equipment design in this document is minimum requirements, with final equipment selection to be made during the PDA phase.

Equipment Cutsheets

The equipment Cutsheets aid in the identification of equipment and serves to assist the owner with establishing standards of quality items. The Cutsheets establish standards of quality, performance, feature, and construction.

General Information

- All equipment shall be heavy duty industrial grade.
- All equipment shall be “equal to or better than” the listed equipment.
- Quantities have been established based on initial floor plans. All quantities need to be verified by the final design team.
- At each phase of the design process, the team will need to review the Equipment Layout Drawings and Equipment List with the SFMTA to verify that they are acceptable.

Preliminary Equipment List

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							MAINTENANCE							
							60' Bus Repair Bay (10)							
			●				1128	Cabinet, computer, mobile	6	26	24	68	CF/CI	
							1184	Cabinet, storage, shop/locker	26	24	24	72	OF/OI	
							1396	Platform, work, roof, portable (set of two)	1				CF/CI	
							1425	Rack, arm, single face, six foot wide, 15,000 pound	1	72	61	144	CF/CI	
							1444	Storage unit, 42 bin	6	33-3/4	12	42	CF/CI	
							1800	Toolbox, rolling	40	24	48		OF/OI	
							1860	Workbench, severe use, six foot	10	72	32	34	CF/CI	
							2165	Jack, floor, five ton	2	62-1/4	16-3/4	48	CF/CI	
							2370	Dolly, wheel	6	39-1/2	43-1/2	35	CF/CI	
							2372	Dolly, wheel, high lift	10	47-1/2	42	72	CF/CI	
							2644	Recovery unit, refrigerant, rolling	4	36	24	50	CF/CI	
							2835	Vise, five inch	10	9	18	10	CF/CI	
			●				3540	Tank, parts cleaning, 15 gallon	6	36	22	38-1/2	OF/OI	
●	●		●	●			5630	Lift, axle, three post, 105,000 pound, shallow design	9	25-3/8	14-1/4	32-7/8	CF/CI	
●	●		●	●			5692	Lift, axle, scissor, adjustable, 90,000 pound	1	---	66	---	CF/CI	
●			●	●			7541	Pump, diaphragm, used fluid evacuation (UC)	6	14-3/4	10-3/4	16	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							60' Bus Repair Bay (10) [Continued]							
●	●			●			7780	Reel bank	6	---	---	---	CF/CI	
							9350	Harness, safety, I-beam, trolley, self-retracting		11-3/4	8-3/4	24	CF/CI	
								King Pins Press	2					Insufficient information on the equipment to provide a DCS
								Caliper Hoists	6					Insufficient information on the equipment to provide a DCS
							60' Bus Preventative Maintenance (5)							
							Lower Level Work Area (LLWA)							
							1185	Cabinet, storage, shop	5	36	18	78	CF/CI	
							1688	Shelving unit, eight shelf	5	36	18	84	CF/CI	
							1800	Toolbox, rolling	5	24	48		OF/OI	
							1860	Workbench, severe use, six foot	5	72	32	34	CF/CI	
							2835	Vise, five inch	5	9	18	10	CF/CI	
							5442	Lift, parts, straddle	1	84	62	372	CF/CI	
●	●	●	●	●			5558	Lift, man, mobile, LLWA	5	138	63	58	CF/CI	
●			●	●			7541	Pump, diaphragm, used fluid evacuation (UC)	2	14-3/4	10-3/4	16	CF/CI	
				●			7575	Hose and dispenser (GO)	5	2	2	10	CF/CI	
●	●						7993	Drain pan, rolling (UC)	5	33	24	11	CF/CI	

EQUIPMENT LIST
3 LEVEL

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Ground Level							
			●				1128	Cabinet, computer, mobile	3	26	24	68	CF/CI	
							1860	Workbench, severe use, six foot	5	72	32	34	CF/CI	
							2835	Vise, five inch	5	9	18	10	CF/CI	
			●				3540	Tank, parts cleaning, 15 gallon	3	36	22	38-1/2	OF/OI	
●	●			●			7780	Reel bank	3	---	---	---	CF/CI	
●	●						9315	Cover, safety, metal	96	38	40-1/2	2	CF/CI	
							Upper Level Work Platform (ULWP)							
							1860	Workbench, severe use, six foot	2	72	32	34	CF/CI	
							2835	Vise, five inch	2	9	18	10	CF/CI	
●	●	●	●	●			5010	Crane, bridge, top running, 5 ton	2	0	0	0	CF/CI	
							60' Bus Tire Bay (1)							
							1860	Workbench, severe use, six foot	1	72	32	34	CF/CI	
							2835	Vise, five inch	1	9	18	10	CF/CI	
●	●		●	●			5692	Lift, axle, scissor, adjustable, 90,000 pound	1	---	66	---	CF/CI	
●	●			●			7710	Reel bank	2	---	---	---	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							60' Bus Minor Body Repair (1)							
			●				1128	Cabinet, computer, mobile	1	26	24	68	CF/CI	
							1860	Workbench, severe use, six foot	1	72	32	34	CF/CI	
							2835	Vise, five inch	1	9	18	10	CF/CI	
●	●		●	●			5630	Lift, axle, three post, 105,000 pound, shallow design	1	25-3/8	14-1/4	32-7/8	CF/CI	
							5645	Lift, parallelogram, 75,000 pounds, 48 feet	1	392-1/2	0	69	CF/CI	
●	●			●			7710	Reel bank	2	---	---	---	CF/CI	
							Minor Body Shop							
							1183	Cabinet, storage, heavy duty	1	48	24	78	CF/CI	
							1183	Cabinet, storage, heavy duty	1	48	24	78	CF/CI	
							1183	Cabinet, storage, heavy duty	?	48	24	78	CF/CI	
							1183	Cabinet, storage, heavy duty	3	48	24	78	CF/CI	
							1185	Cabinet, storage, shop	2	36	18	78	CF/CI	
							1200	Cart, parts	5	24	48	33-1/2	CF/CI	
							1421	Rack, arm, single face, six foot wide	1	74	22-1/4	84	CF/CI	
							1437	Rack, windshield, vertical	4	72	48	87	CF/CI	
	●						1456	Rack, bulk storage, six foot	2	72	24	96	CF/CI	
							1625	Rack, sheet metal, five bay	1	120	84	36	CF/CI	
							1688	Shelving unit, eight shelf	2	36	18	84	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Minor Body Shop [Continued]							
							1801	Toolbox	2	28	17	35	OF/OI	
							1806	Workstation, electronics, static dissipative, six foot, with drawers	4	72	36	52	CF/CI	
							1860	Workbench, severe use, six foot	1	72	32	34	CF/CI	
							1950	Cabinet, flammable materials, large	5	43	18	65	CF/CI	
							2105	Press, air/hydraulic, 25 ton	1	42-1/2	30	81	CF/CI	
							2610	Drill press, variable speed, 20 inch	1	22	36	69	CF/CI	
							2678	Sander, belt/disc	1	24	31-1/4	54-1/2	CF/CI	
							2692	Saw, band, vertical, 14 inch	1	20	20	68	CF/CI	
							2698	Saw, cutoff, abrasive, 14 inch	1	11 3/4	19 3/4	25 1/4	CF/CI	
							2765	Torch, oxyacetylene, with cart	1	28	16-1/2	43-1/2	CF/CI	
							2780	Cutter, plasma	1	18	36	35	CF/CI	
							2780	Cutter, plasma	1	18	36	35	CF/CI	
							2835	Vise, five inch	1	9	18	10	CF/CI	
							2838	Vise, eight inch	4	10 3/4	20 1/2	13 1/4	CF/CI	
							2885	Buffer/grinder, eight inch, with pedestal	1	24	13	47	CF/CI	
							3085	Cabinet, abrasive blast, with dust collector	1	65	25	64	CF/CI	
								Plate Shear, table top, 8-inch (Dayton #4YG37A)	1				OF/OI	Insufficient information on the equipment to provide a DCS
								Clean air duster, down draft (ICA #00301)	1				OF/OI	Insufficient information on the equipment to provide a DCS
								Sander/Vacuum Combo (Festool Cleantec)	2				OF/OI	Insufficient information on the equipment to provide a DCS

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Minor Body Shop [Continued]							
								Sander/Vacuum Combo (Mirka)	2				OF/OI	Insufficient information on the equipment to provide a DCS
								Wet/Dry Vac, 19-gallon (Nilfisk #302001540)	2				OF/OI	Insufficient information on the equipment to provide a DCS
								Sander/Vacuum Combo, 17-gallon (Dynabrade #61301)	1				OF/OI	Insufficient information on the equipment to provide a DCS
								Ram Kit, hydraulic, 4-ton	1				OF/OI	Insufficient information on the equipment to provide a DCS
								Ram Kit, hydraulic, 10-ton	1				OF/OI	Insufficient information on the equipment to provide a DCS
								Heat lamps, portable (Infratech #SRV-1615)	2				OF/OI	Insufficient information on the equipment to provide a DCS
							2740	Welder, MIG, with cart	1	18	37	36	CF/CI	
							2742	Welder, MIG, portable	1	18	37	36	CF/CI	
							2740	Welder, MIG, with cart	1	18	37	36	CF/CI	
							2760	Welder, TIG	1	18-1/2	43	31-1/2	CF/CI	
								Tennsmith 52" Electric Shear (#LM410R)	1					Insufficient information on the equipment to provide a DCS
							2672	Roller, bender, plate, hand operated	1	68	22	50	CF/CI	
●	●			●			7710	Reel bank	1	---	---	---	CF/CI	
								Body Shop Office Furniture	1					Insufficient information on the equipment to provide a DCS
								Computer Workstations	2					Insufficient information on the equipment to provide a DCS
							60' Bus Chassis Wash (1)							
			●	●			5645	Lift, parallelogram, 75,000 pounds, 48 feet	1	576	112	63	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Wash Equipment Room							
●	●	●	●	●			3718	Washer, high pressure, hot water, NG, 4 GPM	2	47-1/2	21	51	CF/CI	
							Common Work Area (CWA) (2)							
							1185	Cabinet, storage, shop	4	36	18	78	CF/CI	
							1445	Storage unit, 48 bin	4	36	18	84	CF/CI	
							1860	Workbench, severe use, six foot	2	72	32	34	CF/CI	
	●						1950	Cabinet, flammable materials, large	4	43	18	65	CF/CI	
							2102	Press, hydraulic, 20 ton	2	31	30	74	CF/CI	
	●		●				2610	Drill press, variable speed, 20 inch	2	22	36	69	CF/CI	
			●				2689	Saw, band, horizontal, large	2	72	60	37	CF/CI	
			●				2698	Saw, cutoff, abrasive, 14 inch	2	11	19-3/4	23-5/8	CF/CI	
							2835	Vise, five inch	2	9	18	10	CF/CI	
			●				2880	Buffer/grinder, eight inch, with dust collector	2	24-3/4	41	41-3/4	CF/CI	
			●	●			3085	Cabinet, abrasive blast, with dust collector	2	38	25	64	CF/CI	
●	●	●	●	●			3555	Washer, parts, automatic, front load	2	50	62	69	CF/CI	
							1960	Gas Cylinder Storage (propane)	1	62	29	82	CF/CI	
							1960	Gas Cylinder Storage (acetylene)	1	62	29	82	CF/CI	
							1960	Gas Cylinder Storage (oxygen)	1	62	29	82	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Common Work Area (CWA) (2) [Continued]							
							1960	Gas Cylinder Storage (argon)	1	62	29	82	CF/CI	
								Portable Fan, Large	2				OF/OI	Insufficient information on the equipment to provide a DCS
							Portable Equipment Storage (PES) (2)							
			●				2440	Scrubber, floor, walk behind, 28 inch path, battery operated	2	37-1/2	64	43	CF/CI	
			●				2740	Welder, MIG, with cart	2	18	36	35	CF/CI	
			●				2750	Welder, multiprocess	2	38	23	30	CF/CI	
			●				2760	Welder, TIG	2	18-1/2	43	31-1/2	CF/CI	
							2770	Screen, welding	2	144	18	77-1/2	CF/CI	
			●	●			3275	Extractor, fume, welding, portable, 1,200 CFM	2	24	49-1/4	31-1/4	CF/CI	
				●			7995	Receiver, 25 gallon, portable (UC)	2	24	24	45	CF/CI	
				●			7996	Receiver, 25 gallon, portable (UO)	2	24	24	45	CF/CI	
							Tool Box Storage							
								Tool boxes provided by the SFMTA or Mechanics/Technicians						

EQUIPMENT LIST
3 LEVEL

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Tool Storage							
●							1098	Board, peg, tool	4	72	1/2	36	CF/CI	
							1185	Cabinet, storage, shop	2	36	18	78	CF/CI	
							1688	Shelving unit, eight shelf	2	36	18	84	CF/CI	
							Cleaning Equipment Storage (Ground Level)							
							1185	Cabinet, storage, shop	2	36	18	78	CF/CI	
							1204	Cart, cleaning	4	21-3/4	46	38-3/8	CF/CI	
	●						1456	Rack, bulk storage, six foot	4	72	24	96	CF/CI	
							1688	Shelving unit, eight shelf	4	36	18	84	CF/CI	
	●						1950	Cabinet, flammable materials, large	2	43	18	65	CF/CI	
							1966	Pallet, containment, hazardous materials, four drum	2	49	49	10-1/4	CF/CI	
							AC Shop/Storage							
							10001	Rack, AC	2	---	---	---	OF/OI	
							1185	Cabinet, storage, shop	2	36	18	78	CF/CI	
							1188	Cabinet, storage, shop, overhead	1	36	13	27	CF/CI	
							1860	Workbench, severe use, six foot	2	72	32	34	CF/CI	
	●						1950	Cabinet, flammable materials, large	2	43	18	65	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							AC Shop/Storage [Continued]							
							2835	Vise, five inch	2	9	18	10	CF/CI	
							3288	Fume extraction arm, bench mounted	1	15	11	60	CF/CI	
							Battery Rebuild Shop							
							10002	Rack, battery	1				OF/OI	SFMTA will custom build
							1185	Cabinet, storage, shop	2	36	18	78	CF/CI	
							1860	Workbench, severe use, six foot	1	72	32	34	CF/CI	
	●						1950	Cabinet, flammable materials, large	2	43	18	65	CF/CI	
							2835	Vise, five inch	1	9	18	10	CF/CI	
							Tire Shop/Storage							
●	●		●	●			1632	Carousel, storage, tire, 44 inch	2	179	112	---	CF/CI	
●	●						1636	Rack, tire, heavy duty, one tier	1	60	26	47-1/2	CF/CI	
							1860	Workbench, severe use, six foot	1	72	32	34	CF/CI	
			●	●			2353	Changer, heavy duty, 44 inch max tire	1	78	48	36	CF/CI	
	●		●	●			2363	Balancer, tire, heavy duty	1	93	62	84	CF/CI	
	●		●	●			2365	Cage, inflation, tire	1	28	36	60	CF/CI	
				●			2368	Spreader, tire	1	25	35	17	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Tire Shop/Storage [Continued]							
							2835	Vise, five inch	1	9	18	10	CF/CI	
●	●			●			7710	Reel bank	1	---	---	---	CF/CI	
							Lube/Compressor Room							
				●			7520	Pump, air piston, 10:1 ratio	6	8 dia.	---	28-1/2	CF/CI	
●				●			7531	Pump, diaphragm, non-mixing (EC)	1	14-3/4	10-1/4	16	CF/CI	
	●						7907	Tank, double wall, polyethylene, 275 gallon	1	47 dia.	---	58-1/2	CF/CI	
	●	●	●	●			7970	Tank, double wall, cube, 500 gallon	7	61	46	61	CF/CI	
●	●	●	●	●			8276	Compressor, air, screw, rotary, 40 HP, with integral dryer	2	69-5/8	35-3/8	60-1/4	CF/CI	
●	●			●			8637	Receiver, vertical mounted, 400 gallon	1	36 dia.	---	101	CF/CI	
							Electronic Bench Shop							
							10003	Equipment, test, electronic	1				OF/OI	
	●						1110	Cabinet, 10 drawer, modular	4	30	27-3/4	59	CF/CI	
							1185	Cabinet, storage, shop	2	36	18	78	CF/CI	
							1745	Stool, electronic station, anti-static	6	18	18	34-1/4	CF/CI	
			●				1805	Workstation, electronics, static dissipative, five foot, with shelf	6	60	30	33-1/2	CF/CI	
							3288	Large fume/dust hood	1	15-1/4	11-3/4	60	CF/CI	Dimensions

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Electronic Bench Shop [Continued]							
								Signal Cabinet Testing Rack	2				OF/OI	Insufficient information on the equipment to provide a DCS
								Strong hold cabinet (OF/CI)	3				OF/OI	Insufficient information on the equipment to provide a DCS
							FARE BOX AND CLIPPER CARD READER REPAIR SHOP (Not included in Equipment Layout Drawings)							
							Incoming and Outgoing Device Storage							
	●						1456	Rack, bulk storage, six foot	4	72	24	96	CF/CI	
							1688	Shelving unit, eight shelf	4	36	18	84	CF/CI	
							Shop							
							1185	Cabinet, storage, shop	2	36	18	78	CF/CI	
							1688	Shelving unit, eight shelf	2	36	18	84	CF/CI	
							1860	Workbench, severe use, six foot	2	72	32	34	CF/CI	
							1950	Cabinet, flammable materials, large	1	43	18	65	CF/CI	
	●		●				2610	Drill press, variable speed, 20 inch	1	22	36	69	CF/CI	
							2835	Vise, five inch	2	9	18	10	CF/CI	
							2885	Buffer/grinder, eight inch, with pedestal	1	24	13	47	CF/CI	
							3288	Fume extraction arm, bench mounted	1	15-1/4	11-1/4	60	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Storage							
							1185	Cabinet, storage, shop	5	36	18	78	CF/CI	
							1688	Shelving unit, eight shelf	5	36	18	84	CF/CI	
							Parts Storage							
							1110	Cabinet, 10 drawer, modular	2	30	28	59	CF/CI	
	●						1456	Rack, bulk storage, six foot	8	72	24	96	CF/CI	
							1688	Shelving unit, eight shelf	8	36	18	84	CF/CI	
			●				5410	Forklift, electric, 10,000 pound	3	127-3/4	58-3/4	91	OF/CI	
							OFFICE							
								Safe	2				OF/OI	Insufficient information on the equipment to provide a DCS
							SERVICE AND CLEAN							
							Service Position (Level 2)							
●	●			●			3300	Tank, mop, with wringer	2	40	25	42	CF/CI	
●	●		●				3610	Vacuum, canister, stainless steel	4	20-1/8	26	52	CF/CI	
●	●			●			7710	Reel bank	3	---	---	---	CF/CI	
								96-gallon trash containers (black, blue, + green)	6				OF/OI	Insufficient information on the equipment to provide a DCS
								Biohazard Bin	1				OF/OI	Insufficient information on the equipment to provide a DCS

EQUIPMENT LIST
3 LEVEL

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Service Position (Level 3)							
●	●			●			3300	Tank, mop, with wringer	2	40	25	42	CF/CI	
●	●		●				3610	Vacuum, canister, stainless steel	4	20-1/8	26	52	CF/CI	
●	●			●			7710	Reel bank	3	---	---	---	CF/CI	
								96-gallon trash containers (black, blue, + green)	6				OF/OI	Insufficient information on the equipment to provide a DCS
								Biohazard Bin	1				OF/OI	Insufficient information on the equipment to provide a DCS
							Bus Washer (1) (Level 2)							
●	●	●	●	●			3834	Washer, bus, drive through, four brush	1	1020	192	170	CF/CI	
							Bus Washer (2) (Level 3)							
●	●	●	●	●			3834	Washer, bus, drive through, four brush	1	1020	192	170	CF/CI	
							Wash Equipment Room (1) (Level 2)							
●	●	●	●	●			3718	Washer, high pressure, hot water, NG, 4 GPM	2	47-1/2	21	51	CF/CI	
							Wash Equipment Room (2) (Level 3)							
●	●	●	●	●			3718	Washer, high pressure, hot water, NG, 4 GPM	2	47-1/2	21	51	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Cleaning Equipment Storage (on Bus Garage Level 2)							
							1185	Cabinet, storage, shop	4	36	18	78	CF/CI	
							1204	Cart, cleaning	8	21-3/4	46	38-3/8	CF/CI	
	●						1456	Rack, bulk storage, six foot	10	72	24	96	CF/CI	
							1688	Shelving unit, eight shelf	4	36	18	84	CF/CI	
	●						1950	Cabinet, flammable materials, large	4	43	18	65	CF/CI	
							1966	Pallet, containment, hazardous materials, four drum	4	49	49	10-1/4	CF/CI	
							Cleaning Equipment Storage (on Bus Garage Level 3)							
							1185	Cabinet, storage, shop	4	36	18	78	CF/CI	
							1204	Cart, cleaning	8	21-3/4	46	38-3/8	CF/CI	
	●						1456	Rack, bulk storage, six foot	10	72	24	96	CF/CI	
							1688	Shelving unit, eight shelf	4	36	18	84	CF/CI	
	●						1950	Cabinet, flammable materials, large	4	43	18	65	CF/CI	
							1966	Pallet, containment, hazardous materials, four drum	4	49	49	10-1/4	CF/CI	
							PARTS							
							Parts Storage							
●							1098	Board, peg, tool	4	72	1/2	36	CF/CI	
●	●						1106	Cabinet, six drawer, modular, underbench	10	30	27-3/4	33-1/2	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Parts Storage [Continued]							
●	●	●	●				1500	Storage system, 2,000 pound capacity, with rack mounted crane	1	203	436	184	CF/CI	
	●						1536	Rack, pallet, ten foot, two tier	2	126	36	120	CF/CI	
							1688	Shelving unit, eight shelf	42	36	18	84	CF/CI	
●	●	●	●	●			1730	Storage system, automated, vertical tray	2	---	---	---	CF/CI	
							1753	Table, layout, stainless steel top, eight foot	3	96	36	34	CF/CI	
			●				5404	Forklift, electric, 4,000 pound, stand up	1	93	40-1/4	95	CF/CI	
							5420	Forklift, 10,000 pound, LPG	1	175	69	90-1/2	CF/CI	
							1950	Cabinet, flammable materials, large	8	43	18	65	OF/CI	
							Battery Storage							
	●						1536	Rack, pallet, ten foot, two tier	2	126	36	120	CF/CI	
							1688	Shelving unit, eight shelf	2	36	18	84	CF/CI	
							SHARED							
							Building Storage							
							1185	Cabinet, storage, shop	2	36	18	78	CF/CI	
	●						1456	Rack, bulk storage, six foot	2	72	24	96	CF/CI	
							1688	Shelving unit, eight shelf	2	36	18	84	CF/CI	
	●						1950	Cabinet, flammable materials, large	2	43	18	65	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Meet and Greet							
●	●	●	●	●			5558	Lift, man, mobile, LLWA	1	138	63	58	CF/CI	
							7242	Fluid management system, wired	1	---	---	---	CF/CI	
							Revenue Office							
							1215							
							1688	Shelving unit, eight shelf	2	36	18	84	CF/CI	
			●				1805	Workstation, electronics, static dissipative, five foot, with shelf	1	60	30	33-1/2	CF/CI	
●							9900	Vault, collection, revenue	2	32	36	66	CF/CI	
●	●		●				9910	Probe, farebox, with software system	2	---	---	---	CF/CI	
								Isolation Boxes	2					Insufficient information on the equipment to provide a DCS
							Sheet Metal Shop							
							1185	Cabinet, storage, shop	2	36	18	78	CF/CI	
	●						1421	Rack, arm, single face, six foot wide	1	74-3/8	22-1/8	84	CF/CI	
							1435	Rack, vertical	1	36	24	84	CF/CI	
	●						1436	Rack, sheet, vertical	1	50	44	84	CF/CI	
							1445	Storage unit, 48 bin	1	36	18	84	CF/CI	
	●						1456	Rack, bulk storage, six foot	2	72	24	96	CF/CI	
							1793	Table, welding, large	1	98	62	38	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Sheet Metal Shop [Continued]							
							1860	Workbench, severe use, six foot	1	72	32	34	CF/CI	
	●						1950	Cabinet, flammable materials, large	1	43	18	65	CF/CI	
	●						2102	Press, hydraulic, 20 ton	1	31	30	74	CF/CI	
	●		●				2610	Drill press, variable speed, 20 inch	1	22	36	69	CF/CI	
	●		●				2690	Saw, band, horizontal, small	1	40	84	49	CF/CI	
			●				2698	Saw, cutoff, abrasive, 14 inch	1	11	19-3/4	23-5/8	CF/CI	
	●		●				2742	Welder, MIG, portable	1	19	40	30	CF/CI	
			●				2760	Welder, TIG	1	18-1/2	43	31-1/2	CF/CI	
							2765	Torch, oxyacetylene, with cart	1	28	16-1/2	43-1/2	CF/CI	
							2770	Screen, welding	2	144	18	77-1/2	CF/CI	
			●	●			2780	Cutter, plasma	1	18	36	35	CF/CI	
							2835	Vise, five inch	1	9	18	10	CF/CI	
			●				2880	Buffer/grinder, eight inch, with dust collector	1	24-3/4	41	41-3/4	CF/CI	
			●	●			3085	Cabinet, abrasive blast, with dust collector	1	38	25	64	CF/CI	
●	●	●	●				3290	Fume extraction arm, welding	1	---	---	---	CF/CI	

Discipline Coordination							Equip			Dimensions (inches)			Furnish/	
Arch	Struc	Mech	Elec	Plum	Priority Equipment	Seismic Certification	ID#	Description	Qty	Length	Width	Height	Install	Project Comments
							Facilities Stationary Engineer							
●							1098	Board, peg, tool	1	72	1/2	36	CF/CI	
●	●						1106	Cabinet, six drawer, modular, underbench	2	30	27-3/4	33-1/2	CF/CI	
	●						1110	Cabinet, 10 drawer, modular	2	30	27-3/4	59	CF/CI	
							1185	Cabinet, storage, shop	1	36	18	78	CF/CI	
	●						1456	Rack, bulk storage, six foot	1	72	24	96	CF/CI	
							1688	Shelving unit, eight shelf	2	36	18	84	CF/CI	

Equipment Datasheets/Cutsheets

1098 Equipment Datasheet

Manufacturer:		**Kennedy Manufacturing Company**					**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)		
Model No.:		**50004UGY**						**Equipment**	**72**		**1/2**		**36**		
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** / **Right**	--- / ---		**Front** / **Back**	36 / ---	**Above** / **Below**	--- / ---	
DISCIPLINE COORDINATION:															
Architectural		Wall mounted 36 inches above finish floor typically.					**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**				
Structural		---					**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**				
Mechanical		---					**Venting**		Connection (inches)		**---**				
									Volume (CFM)		**---**				
Electrical		---					**Connection Size**		Requirements	**---**	**---**	**---**			
									Voltage	**---**	**---**	**---**			
									Phase	**---**	**---**	**---**			
									Horsepower (HP)	**---**	**---**	**---**			
									Amps	**---**	**---**	**---**			
							Connection Type		**---**						
Plumbing		---					**Domestic Water**		Connection (inches)		**---**				
									Flow Rate (GPM)		**---**				
									Capacity (PSI)		**---**				
							Natural Gas		Connection (inches)		**---**				
									Capacity (BTU)		**---**				
							Drain		Floor Drain (Y/N)		**N**				
							Compressed Air		Connection (inches)		**---**				
									Volume (CFM)		**---**				
									Capacity (PSI)		**---**				

Equipment Description:

Board, peg, tool

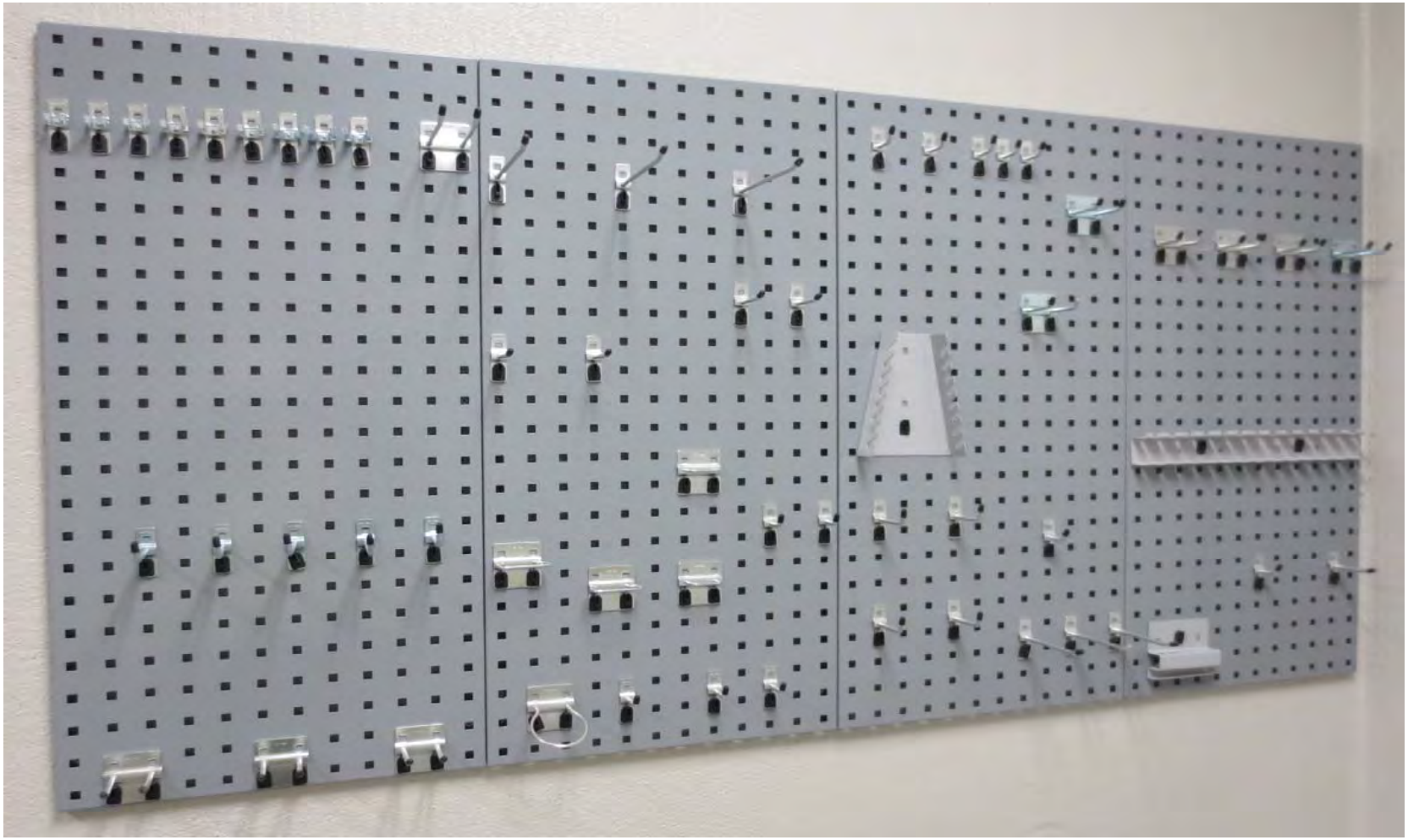
EQ ID Number:

1098

1098 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Board, peg, tool	**1098**

Manufacturer: Kennedy Manufacturing Company **Model No.:** 50004UGY



1106 Equipment Datasheet

Manufacturer:	**Equipto**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**4433**						**Equipment**	**30**		**27-3/4**		**33-1/2**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	---	**Front**	42	**Above**	---
								Right	---	**Back**	---	**Below**	---
DISCIPLINE COORDINATION:													
Architectural	Unit to be installed below workbench or architectural millwork; Coordinate with equipment to determine millwork location and height AFF.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Unit to be anchored to the floor.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**----**			
Electrical	---						**Connection Size**	Requirements		**---**	**---**	**---**	
								Voltage		**---**	**---**	**---**	
								Phase		**---**	**---**	**---**	
								Horsepower (HP)		**---**	**---**	**---**	
								Amps		**---**	**---**	**---**	
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Cabinet, six drawer, modular, underbench

EQ ID Number:

1106

1106 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Cabinet, six drawer, modular, underbench	**1106**

Manufacturer: Equipto **Model No.:** 4433

1110 Equipment Datasheet

Manufacturer:	**Equipto**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**4424**							**Equipment**	**30**		**27-3/4**		**59**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** --- **Right** ---		**Front** 48 **Back** ---		**Above** 12 **Below** ---	
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Unit weight: 462 pounds; full weight: 4,462 pounds						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**---**	**---**	**---**		
									Voltage	**---**	**---**	**---**		
									Phase	**---**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**---**	**---**	**---**		
							Connection Type		**---**					
Plumbing	---						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Cabinet, 10 drawer, modular

EQ ID Number:

1110

1110 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Cabinet, 10 drawer, modular	**1110**

Manufacturer: Equipto **Model No.:** 4424

1128 Equipment Datasheet

Manufacturer:	**Strong Hold**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**26-CC-LCD-240-1SOSRK with casters**						**Equipment**	**26**		**24**		**68**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	**6**	**Front**	**36**	**Above**	**---**
								Right	**6**	**Back**	**6**	**Below**	**---**

DISCIPLINE COORDINATION:

Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**
Structural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**
Mechanical	---	**Venting**	Connection (inches)	**---**
			Volume (CFM)	**---**
Electrical	Unit is mobile; provide standard grounded receptacles and data receptacles throughout usable area(s).	**Connection Size**	Requirements	**Unit** / **Fan** / **---**
			Voltage	**120** / **120** / **---**
			Phase	**1** / **1** / **---**
			Horsepower (HP)	**---** / **---** / **---**
			Amps	**15** / **15** / **---**
		Connection Type	**Provide standard grounded receptacle**	
Plumbing	---	**Domestic Water**	Connection (inches)	**---**
			Flow Rate (GPM)	**---**
			Capacity (PSI)	**---**
		Natural Gas	Connection (inches)	**---**
			Capacity (BTU)	**---**
		Drain	Floor Sink (Y/N)	**N**
		Compressed Air	Connection (inches)	**---**
			Volume (CFM)	**---**
			Capacity (PSI)	**---**

Equipment Description:

Cabinet, computer, mobile

EQ ID Number:

1128

1128 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Cabinet, computer, mobile	**1128**

Manufacturer:	Strong Hold	Model No.:	26-CC-LCD-240-1SOSRK with casters

1185 Equipment Datasheet

Manufacturer:	**Equipto**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**1710**						**Equipment**		**36**		**18**		**78**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** --- **Right** ---		**Front** 36 **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**---**	**---**	**---**		
									Voltage	**---**	**---**	**---**		
									Phase	**---**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**---**	**---**	**---**		
							Connection Type		**---**					
Plumbing	---						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Cabinet, storage, shop

EQ ID Number:

1185

1185 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Cabinet, storage, shop	**1185**

Manufacturer: Equipto **Model No.:** 1710

1204 Equipment Datasheet

Manufacturer:	**Rubbermaid Commercial Products**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**6173-88 with accessories**						**Equipment**	**21-3/4**		**46**		**38-3/8**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ----	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Cart, cleaning

EQ ID Number:

1204

1204 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Cart, cleaning	**1204**

Manufacturer: Rubbermaid Commercial Products **Model No.:** 6173-88 with accessories

1421 Equipment Datasheet

Manufacturer:	**Equipto**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**1062-72 with 1063**						**Equipment**		**74-3/8**		**22-1/8**		**84**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** / **Right**	**24** / **24**		**Front** / **Back**	**72** / **0**	**Above** / **Below**	**24** / **---**
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Coordinate anchor bolt requirements with local codes; Weight: 162 pounds; 4,550 Total Capacity.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**---**	**---**	**---**		
									Voltage	**---**	**---**	**---**		
									Phase	**---**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**---**	**---**	**---**		
							Connection Type		**---**					
Plumbing	---						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Rack, arm, single face, six foot wide

EQ ID Number:

1421

1421 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Rack, arm, single face, six foot wide	**1421**

Manufacturer: Equipto **Model No.:** 1062-72 with 1063

1435 Equipment Datasheet

Manufacturer:	**SPG/Jarke/Cillis**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**CR-834**						**Equipment**	**36**		**24**		**84**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 36 **Back** ---		**Above** 24 **Below** ---	

DISCIPLINE COORDINATION:									
Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**					
Structural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**					
Mechanical	---	**Venting**	Connection (inches)	---					
			Volume (CFM)	---					
Electrical	---	**Connection Size**	Requirements	---	---	---			
			Voltage	---	---	---			
			Phase	---	---	---			
			Horsepower (HP)	---	---	---			
			Amps	---	---	---			
		Connection Type	---						
Plumbing	---	**Domestic Water**	Connection (inches)	---					
			Flow Rate (GPM)	---					
			Capacity (PSI)	---					
		Natural Gas	Connection (inches)	---					
			Capacity (BTU)	---					
		Drain	Floor Drain (Y/N)	**N**					
		Compressed Air	Connection (inches)	---					
			Volume (CFM)	---					
			Capacity (PSI)	---					

Equipment Description:

Rack, vertical

EQ ID Number:

1435

1435 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Rack, vertical	**1435**

Manufacturer: SPG/Jarke/Cillis **Model No.:** CR-834

1436 Equipment Datasheet

Manufacturer:	**Vestil Manufacturing**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**VSSR-15**						**Equipment**	**50**		**44**		**84**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 48 **Back** ---		**Above** 18 **Below** ---	

DISCIPLINE COORDINATION:

Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Structural	Approximate unit weight: 400 pounds. Weight capacity: 6,000 pounds (1,500 pounds per bay) Unit to be anchored to the floor.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Mechanical	---	**Venting**	Connection (inches)	---			
			Volume (CFM)	---			
Electrical	---	**Connection Size**	Requirements	---	---	---	
			Voltage	---	---	---	
			Phase	---	---	---	
			Horsepower (HP)	---	---	---	
			Amps	---	---	---	
		Connection Type	---				
Plumbing	---	**Domestic Water**	Connection (inches)	---			
			Flow Rate (GPM)	---			
			Capacity (PSI)	---			
		Natural Gas	Connection (inches)	---			
			Capacity (BTU)	---			
		Drain	Floor Drain (Y/N)	**N**			
		Compressed Air	Connection (inches)	---			
			Volume (CFM)	---			
			Capacity (PSI)	---			

Equipment Description:

Rack, sheet, vertical

EQ ID Number:

1436

1436 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Rack, sheet, vertical	**1436**

Manufacturer: Vestil Manufacturing **Model No.:** VSSR-15

1445 Equipment Datasheet

Manufacturer:	**Equipto**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**673-9S starter and 673-9A add-on with accessories**						**Equipment**	**36**		**18**		**84**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 48 **Back** 2		**Above** 24 **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Empty weight: 381 pounds; full weight: 1,081 pounds.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Storage unit, 48 bin

EQ ID Number:

1445

1445 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Storage unit, 48 bin	**1445**

Manufacturer:	Equipto	Model No.:	673-9S starter and 673-9A add-on with accessories

1456 Equipment Datasheet

Manufacturer:	**Equipto**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**1028D62S starter and 1028D62A add-on with accessories**						**Equipment**	**72**		**24**		**96**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 72 **Back** 6		**Above** 48 **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Unit to be anchored to the floor.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Rack, bulk storage, six foot

EQ ID Number:

1456

1456 Equipment Cutsheet

Equipment Description:

Rack, bulk storage, six foot

EQ ID Number:

1456

Manufacturer: Equipto

Model No.: 1028D62S starter and 1028D62A add-on with accessories

1500 Equipment Datasheet

Manufacturer:	**Stanley Vidmar**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)			
Model No.:	**2k Stak System**							**Equipment**	**203**		**436**		**184**			
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**	**Left**	**6**	**Front**	**96**	**Above**	**36**			
								Right	**6**	**Back**	**6**	**Below**	**---**			
DISCIPLINE COORDINATION:																
Architectural	Coordinate OSHA clearances, overhead door clearances, duct and piping routing with mechanical/plumbing and design with structural.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**					
Structural	Coordinate the design of slab with manufacturer to accommodate the weight of system and its loaded pallets. Reference design details.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**					
Mechanical	Coordinate duct routing and HVAC equipment with equipment to avoid conflits with bridge crane travel.						**Venting**		Connection (inches)		**---**					
									Volume (CFM)		**---**					
Electrical	---						**Connection Size**		Requirements	**Unit**	**---**	**---**				
									Voltage	**460**	**---**	**---**				
									Phase	**3**	**---**	**---**				
									Horsepower (HP)	**1**	**---**	**---**				
									Amps	**30**	**---**	**---**				
							Connection Type		**Provide disconnect**							
Plumbing	Coordinate pipe routing with equipment to avoid conflicts with bridge crane travel.						**Domestic Water**		Connection (inches)		**---**					
									Flow Rate (GPM)		**---**					
									Capacity (PSI)		**---**					
							Natural Gas		Connection (inches)		**---**					
									Capacity (BTU)		**---**					
							Drain		Floor Drain or Floor Sink (Y/N)		**N**					
							Compressed Air		Connection (inches)		**---**					
									Volume (CFM)		**---**					
									Capacity (PSI)		**---**					

Equipment Description:

Storage system, 2,000 pound capacity, with rack mounted crane

EQ ID Number:

1500

1500 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Storage system, 2,000 pound capacity, with rack mounted crane	**1500**

Manufacturer: Stanley Vidmar **Model No.:** 2k Stak System

1536 Equipment Datasheet

Manufacturer:	**Lyon Workspace Products**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**Uprights 36M120, Beams S120, Decking WD5836H with accessories**						**Equipment**	**126**		**36**		**120**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 144 **Back** 6		**Above** 60 **Below** ---	

DISCIPLINE COORDINATION:

Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Structural	Coordinate anchor bolt requirements with local codes.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Mechanical	---	**Venting**	Connection (inches)	---			
			Volume (CFM)	---			
Electrical	---	**Connection Size**	Requirements	---	---	---	
			Voltage	---	---	---	
			Phase	---	---	---	
			Horsepower (HP)	---	---	---	
			Amps	---	---	---	
		Connection Type	---				
Plumbing	---	**Domestic Water**	Connection (inches)	---			
			Flow Rate (GPM)	---			
			Capacity (PSI)	---			
		Natural Gas	Connection (inches)	---			
			Capacity (BTU)	---			
		Drain	Floor Drain (Y/N)	**N**			
		Compressed Air	Connection (inches)	---			
			Volume (CFM)	---			
			Capacity (PSI)	---			

Equipment Description:

Rack, pallet, ten foot, two tier

EQ ID Number:

1536

1536 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Rack, pallet, ten foot, two tier	**1536**

Manufacturer:	Lyon Workspace Products	Model No.:	Uprights 36M120, Beams S120, Decking WD5836H with accessories

1632 Equipment Datasheet

Manufacturer:	**Vidir Vertical Storage Systems**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**HT54162-0563-12 OR HT54193-0663-12 OR HT54225-0763-12 OR HT54256-0863-12 OR HT54288-0963-12 OR HT54319-1063-12**						**Equipment**		**179**		**112**		**---**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** 6 **Right** 24		**Front** 72 **Back** 6		**Above** 6 **Below** 0	
DISCIPLINE COORDINATION:														
Architectural	Coordinate with building clear heights.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Coordinate with building clear heights. Approximate unit weight: 4,500 pounds. Unit to be anchored to the floor.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**Unit**	**---**	**---**		
									Voltage	**460**	**---**	**---**		
									Phase	**3**	**---**	**---**		
									Horsepower (HP)	**4**	**---**	**---**		
									Amps	**15**	**---**	**---**		
							Connection Type		**Provide disconnect**					
Plumbing	Verify fire protection requirements with local authority having jurisdiction.						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Carousel, storage, tire, 44 inch

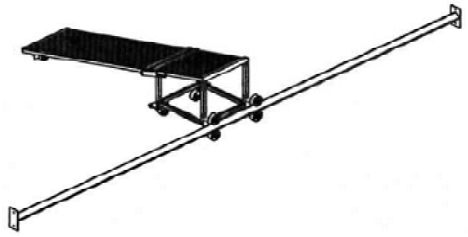
EQ ID Number:

1632

1632 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Carousel, storage, tire, 44 inch	**1632**

Manufacturer:	Vidir Vertical Storage Systems	Model No.:	HT54162-0563-12 OR HT54193-0663-12 OR HT54225-0763-12 OR HT54256-0863-12 OR



1636 Equipment Datasheet

Manufacturer:	**Jarke Manufacturing**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**TW-3943**						**Equipment**	**60**		**26**		**47-1/2**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 48 **Back** 12		**Above** 12 **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Rack, tire, heavy duty, one tier

EQ ID Number:

1636

1636 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Rack, tire, heavy duty, one tier	**1636**

Manufacturer: Jarke Manufacturing **Model No.:** TW-3943

1688 Equipment Datasheet

Manufacturer:	**Equipto**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**773-8S starter with 773-8A add on with accessories**						**Equipment**		**36**		**18**		**84**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** --- **Right** ---		**Front** 48 **Back** ---		**Above** 12 **Below** ---	
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**---**	**---**	**---**		
									Voltage	**---**	**---**	**---**		
									Phase	**---**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**---**	**---**	**---**		
							Connection Type		**---**					
Plumbing	---						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Shelving unit, eight shelf

EQ ID Number:

1688

1688 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Shelving unit, eight shelf	**1688**

Manufacturer: Equipto

Model No.: 773-8S starter with 773-8A add on with accessories

Add-on

Starter

1730 Equipment Datasheet

Manufacturer:	**Kardex Remstar**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**XP HD 500**						**Equipment**	**---**		**---**		**---**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**	**Left**	**---**	**Front**	**60**	**Above**	**24**
								Right	**48**	**Back**	**---**	**Below**	**---**

DISCIPLINE COORDINATION:							
Architectural	Coordinate OSHA clearances, ducting clearances, piping clearances, and design with structural.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Structural	Provide foundation design per Design Details.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Mechanical	Coordinate ducting and HVAC equipment with equipment and architectural to avoid conflicts with unit.	**Venting**	Connection (inches)	**---**			
			Volume (CFM)	**---**			
Electrical	Provide disconnect near unit; Provide data connection adjacent to unit; Provide additional lighting near unit for parts retrieval.	**Connection Size**	Requirements	**Unit**	**---**	**---**	
			Voltage	**460**	**---**	**---**	
			Phase	**3**	**---**	**---**	
			Horsepower (HP)	**---**	**---**	**---**	
			Amps	**14.2**	**---**	**---**	
		Connection Type	**Provide disconnect**				
Plumbing	Coordinate piping with architectural to avoid conflicts with unit.	**Domestic Water**	Connection (inches)	**---**			
			Flow Rate (GPM)	**---**			
			Capacity (PSI)	**---**			
		Natural Gas	Connection (inches)	**---**			
			Capacity (BTU)	**---**			
		Drain	Floor Sink (Y/N)	**N**			
		Compressed Air	Connection (inches)	**---**			
			Volume (CFM)	**---**			
			Capacity (PSI)	**---**			

Equipment Description:	**EQ ID Number:**
Storage system, automated, vertical tray	**1730**

1730 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Storage system, automated, vertical tray	**1730**

Manufacturer: Kardex Remstar **Model No.:** XP HD 500

1753 Equipment Datasheet

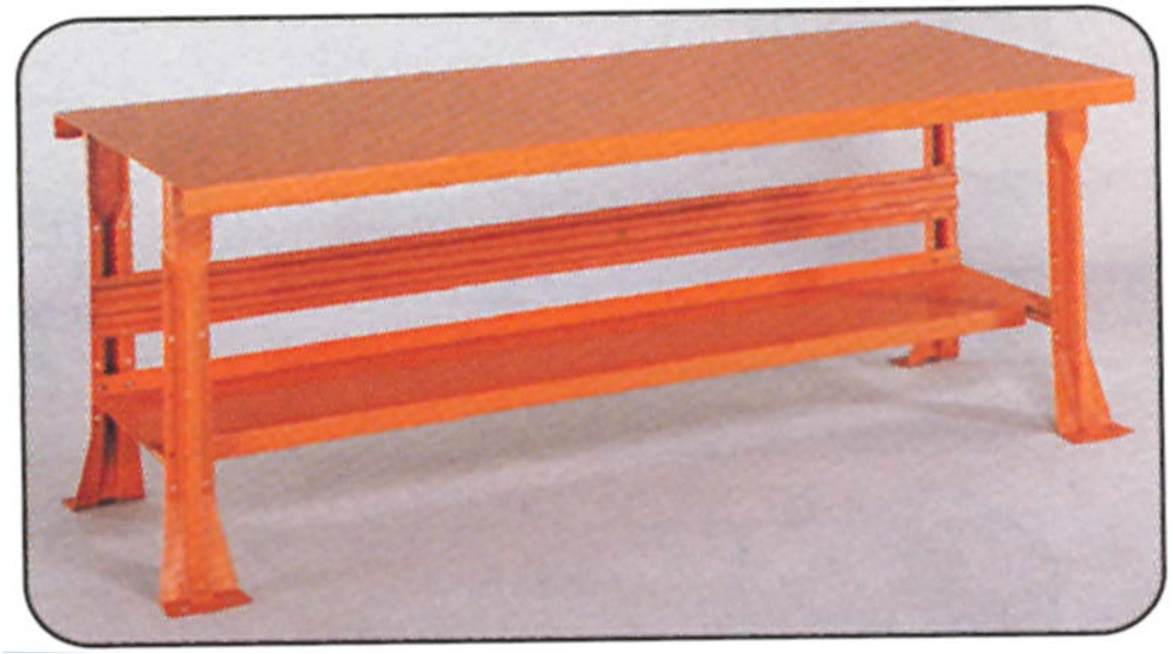
Manufacturer:	**Equipto**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**2333D8 with 441D8SS stainless steel**						**Equipment**		**96**		**36**		**34**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** 36 **Right** 36		**Front** 36 **Back** 36		**Above** 36 **Below** ---	
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**---**	**---**	**---**		
									Voltage	**---**	**---**	**---**		
									Phase	**---**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**---**	**---**	**---**		
							Connection Type		**---**					
Plumbing	---						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:	**EQ ID Number:**
Table, layout, stainless steel top, eight foot	**1753**

1753 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Table, layout, stainless steel top, eight foot	**1753**

Manufacturer:	Equipto	Model No.:	2333D8 with 441D8SS stainless steel



1793 Equipment Datasheet

Manufacturer:		**Weldsale**					**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)		
Model No.:		**WSC - 58B - BUNDLE**					**Equipment**		**96**		**60**		**32**		
Provided:	Cutsheet	Y	Functional Model	N	Design Details	N	**Operational Clearance**	**Left** 36 **Right** 36		**Front** 36 **Back** 36		**Above** --- **Below** ---			
DISCIPLINE COORDINATION:															
Architectural		---					**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)			**N**			
Structural		Weight: 3,775 pounds					**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)			**N**			
Mechanical		---					**Venting**		Connection (inches)			---			
									Volume (CFM)			---			
Electrical		---					**Connection Size**		Requirements	---	---	---			
									Voltage	---	---	---			
									Phase	---	---	---			
									Horsepower (HP)	---	---	---			
									Amps	---	---	---			
							Connection Type		---						
Plumbing		---					**Domestic Water**		Connection (inches)			---			
									Flow Rate (GPM)			---			
									Capacity (PSI)			---			
							Natural Gas		Connection (inches)			---			
									Capacity (BTU)			---			
							Drain		Floor Drain (Y/N)			**N**			
							Compressed Air		Connection (inches)			---			
									Volume (CFM)			---			
									Capacity (PSI)			---			

Equipment Description:

Table, welding, large

EQ ID Number:

1793

1793 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Table, welding, large	**1793**

Manufacturer: Weldsale **Model No.:** WSC - 58B - BUNDLE

1805 Equipment Datasheet

Manufacturer:	**Equipto**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**388-5C with accessories**						**Equipment**	**60**		**30**		**33-1/2**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 36 **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**Power Strip**	**Instrumental Shelf**	**---**		
								Voltage	**120**	**120**	**---**		
								Phase	**1**	**1**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**15**	**15**	**---**		
							Connection Type	**Provide standard grounded receptacle**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain or Floor Sink (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Workstation, electronics, static dissipative, five foot, with shelf

EQ ID Number:

1805

1805 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Workstation, electronics, static dissipative, five foot, with shelf	**1805**

Manufacturer: Equipto **Model No.:** 388-5C with accessories

1860 Equipment Datasheet

Manufacturer:	**Fabricated**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**---**						**Equipment**	**72**		**32**		**34**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 48 **Back** ---		**Above** 36 **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Workbench, severe use, six foot

EQ ID Number:

1860

1860 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Workbench, severe use, six foot	**1860**

Manufacturer: Fabricated **Model No.:** ---

1950 Equipment Datasheet

Manufacturer:	**Equipto**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**FSC45S**						**Equipment**	**43**		**18**		**65**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 48 **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Unit to be anchored to the floor.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain or Floor Sink (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Cabinet, flammable materials, large

EQ ID Number:

1950

1950 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Cabinet, flammable materials, large	**1950**

Manufacturer: Equipto **Model No.:** FSC45S

1966 Equipment Datasheet

Manufacturer:	**Justrite Manufacturing**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**28635**						**Equipment**	**49**		**49**		**10-1/4**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 81 **Back** ---		**Above** 96 **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Sink (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Pallet, containment, hazardous materials, four drum

EQ ID Number:

1966

1966 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Pallet, containment, hazardous materials, four drum	**1966**

Manufacturer: Justrite Manufacturing **Model No.:** 28635

2102 Equipment Datasheet

Manufacturer:	**Nugierfroom Corporation**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)			
Model No.:	**H20-6-3F**						**Equipment**		**31**		**30**		**74**			
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left**	**12**	**Front**	**36**	**Above**	**24**		
									Right	**24**	**Back**	**12**	**Below**	**---**		
DISCIPLINE COORDINATION:																
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**					
Structural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**					
Mechanical	---						**Venting**		Connection (inches)		**---**					
									Volume (CFM)		**---**					
Electrical	---						**Connection Size**		Requirements		**---**		**---**		**---**	
									Voltage		**---**		**---**		**---**	
									Phase		**---**		**---**		**---**	
									Horsepower (HP)		**---**		**---**		**---**	
									Amps		**---**		**---**		**---**	
							Connection Type		**---**							
Plumbing	---						**Domestic Water**		Connection (inches)		**---**					
									Flow Rate (GPM)		**---**					
									Capacity (PSI)		**---**					
							Natural Gas		Connection (inches)		**---**					
									Capacity (BTU)		**---**					
							Drain		Floor Drain (Y/N)		**N**					
							Compressed Air		Connection (inches)		**---**					
									Volume (CFM)		**---**					
									Capacity (PSI)		**---**					

Equipment Description:

Press, hydraulic, 20 ton

EQ ID Number:

2102

2102 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Press, hydraulic, 20 ton	**2102**

Manufacturer: Nugierfroom Corporation **Model No.:** H20-6-3F

2353 Equipment Datasheet

Manufacturer:	**Hennessy Industries, Inc.**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**HIT-6000**						**Equipment**	**78**		**48**		**36**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** 36 **Right** 36		**Front** 60 **Back** 24		**Above** 24 **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**Unit**	**---**	**---**		
								Voltage	**208**	**---**	**---**		
								Phase	**3**	**---**	**---**		
								Horsepower (HP)	**3**	**---**	**---**		
								Amps	**25**	**---**	**---**		
							Connection Type	**Provide disconnect**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**1/4**			
								Volume (CFM)		**5**			
								Capacity (PSI)		**110 to 175**			

Equipment Description:

Changer, heavy duty, 44 inch max tire

EQ ID Number:

2353

2353 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Changer, heavy duty, 44 inch max tire	**2353**

Manufacturer: Hennessy Industries, Inc. **Model No.:** HIT-6000

2363 Equipment Datasheet

Manufacturer:	**Hennessy Industries**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**6450-2D**							**Equipment**	**93**		**62**		**84**	
								Hydraulic Tire Lift	**48**		**34**		**42**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	**24**	**Front**	**60**	**Above**	**24**
								Right	**24**	**Back**	**12**	**Below**	**---**

DISCIPLINE COORDINATION:							
Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Structural	Unit will be anchored to the slab. Approximate weight: 1,500 pounds; Capacity: 500 pounds	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Mechanical	---	**Venting**	Connection (inches)	**---**			
			Volume (CFM)	**---**			
Electrical	Special purpose outlet = L620 plug for single phase or L1520 plug for three phase	**Connection Size**	Requirements	**Unit**	**---**	**---**	
			Voltage	**220**	**---**	**---**	
			Phase	**1**	**---**	**---**	
			Horsepower (HP)	**1-1/2**	**---**	**---**	
			Amps	**20**	**---**	**---**	
		Connection Type	**Provide special purpose outlet**				
Plumbing	Compressed air connection only required when optional accessory of hydraulic lift (Hennessy Model No. 575) is used.	**Domestic Water**	Connection (inches)	**---**			
			Flow Rate (GPM)	**---**			
			Capacity (PSI)	**---**			
		Natural Gas	Connection (inches)	**---**			
			Capacity (BTU)	**---**			
		Drain	Floor Drain (Y/N)	**N**			
		Compressed Air	Connection (inches)	**1/4 NPT**			
			Volume (CFM)	**3**			
			Capacity (PSI)	**120 to 150**			

Equipment Description:

Balancer, tire, heavy duty

EQ ID Number:

2363

2363 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Balancer, tire, heavy duty	**2363**

Manufacturer: Hennessy Industries **Model No.:** 6450-2D

2365 Equipment Datasheet

Manufacturer:	**Branick Industries, Inc.**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**2250**						**Equipment**	**28**		**36**		**60**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** 36 **Right** 36		**Front** 60 **Back** 12		**Above** 36 **Below** 0	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Unit weight 200 pounds						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	Automatic Inflation Kit	**---**	**---**		
								Voltage	**120**	**---**	**---**		
								Phase	**1**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**20**	**---**	**---**		
							Connection Type	**Provide standard grounded receptacle**					
Plumbing	Provide 3/4 inch combination filter-regulator.						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**1/4**			
								Volume (CFM)		**6**			
								Capacity (PSI)		**120**			

Equipment Description:

Cage, inflation, tire

EQ ID Number:

2365

2365 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Cage, inflation, tire	**2365**

Manufacturer: Branick Industries, Inc. **Model No.:** 2250

2368 Equipment Datasheet

Manufacturer:	**Branick Industries**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**S-FLL**						**Equipment**	**25**		**35**		**17**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** 12 **Right** 12		**Front** 60 **Back** 12		**Above** 60 **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**3/8**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**80-120**			

Equipment Description:

Spreader, tire

EQ ID Number:

2368

2368 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Spreader, tire	**2368**

Manufacturer: Branick Industries **Model No.:** S-FLL

2440 Equipment Datasheet

Manufacturer:	**Tennant**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**5700-700D with Fast**						**Unit**	**37-1/2**		**64**		**43**	
							Wall Mounted Charger	**12**		**12**		**5**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---	

DISCIPLINE COORDINATION:					
Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**	
Structural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**	
Mechanical	---	**Venting**	Connection (inches)	**---**	
			Volume (CFM)	**---**	
Electrical	Wall mounted battery charger	**Connection Size**	Requirements	**Unit**	**---** / **---**
			Voltage	**120**	**---** / **---**
			Phase	**1**	**---** / **---**
			Horsepower (HP)	**0.6**	**---** / **---**
			Amps	**16**	**---** / **---**
		Connection Type	**Provide dedicated outlet**		
Plumbing	---	**Domestic Water**	Connection (inches)	**---**	
			Flow Rate (GPM)	**---**	
			Capacity (PSI)	**---**	
		Natural Gas	Connection (inches)	**---**	
			Capacity (BTU)	**---**	
		Drain	Floor Drain or Floor Sink (Y/N)	**N**	
		Compressed Air	Connection (inches)	**---**	
			Volume (CFM)	**---**	
			Capacity (PSI)	**---**	

Equipment Description:

Scrubber, floor, walk behind, 28 inch path, battery operated

EQ ID Number:

2440

2440 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Scrubber, floor, walk behind, 28 inch path, battery operated	**2440**

Manufacturer: Tennant **Model No.:** 5700-700D with Fast

2610 Equipment Datasheet

Manufacturer:	**Clausing Industrial**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**2277 with accessories**						**Equipment**		**22**		**36**		**69**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** / **Right**	**24** / **24**	**Front** / **Back**	**48** / **6**	**Above** / **Below**	**24** / **---**	
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Weight: 650 pounds						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**Unit**	**---**	**---**		
									Voltage	**460**	**---**	**---**		
									Phase	**3**	**---**	**---**		
									Horsepower (HP)	**1.5**	**---**	**---**		
									Amps	**3**	**---**	**---**		
							Connection Type		**Provide disconnect**					
Plumbing	---						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Drill press, variable speed, 20 inch

EQ ID Number:

2610

2610 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Drill press, variable speed, 20 inch	**2610**

Manufacturer: Clausing Industrial **Model No.:** 2277 with accessories

2689 Equipment Datasheet

Manufacturer:	**Kalamazoo Machine Tool**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**H350M with accessories**						**Equipment**		**72**		**60**		**37**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** 48 **Right** 36		**Front** 48 **Back** 120		**Above** 12 **Below** ---	
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**Unit**	**---**	**---**		
									Voltage	**460**	**---**	**---**		
									Phase	**3**	**---**	**---**		
									Horsepower (HP)	**3**	**---**	**---**		
									Amps	**---**	**---**	**---**		
							Connection Type		**Provide disconnect**					
Plumbing	---						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Saw, band, horizontal, large

EQ ID Number:

2689

2689 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Saw, band, horizontal, large	**2689**

Manufacturer: Kalamazoo Machine Tool **Model No.:** H350M with accessories

2690 Equipment Datasheet

Manufacturer:	**Wellsaw**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**1016 with accessories**							**Equipment**	**40**		**84**		**49**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** 48 **Right** 48		**Front** 36 **Back** 12		**Above** 36 **Below** ---		
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**					
Structural	Weight: 900 pounds						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**					
Mechanical	---						**Venting**	Connection (inches)	---					
								Volume (CFM)	---					
Electrical	---						**Connection Size**	Requirements	**Unit**	---	---			
								Voltage	**460**	---	---			
								Phase	**3**	---	---			
								Horsepower (HP)	**2**	---	---			
								Amps	**3.2**	---	---			
							Connection Type	**Provide disconnect**						
Plumbing	---						**Domestic Water**	Connection (inches)	---					
								Flow Rate (GPM)	---					
								Capacity (PSI)	---					
							Natural Gas	Connection (inches)	---					
								Capacity (BTU)	---					
							Drain	Floor Drain (Y/N)	**N**					
							Compressed Air	Connection (inches)	---					
								Volume (CFM)	---					
								Capacity (PSI)	---					

Equipment Description:

Saw, band, horizontal, small

EQ ID Number:

2690

2690 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Saw, band, horizontal, small	**2690**

Manufacturer: Wellsaw **Model No.:** 1016 with accessories

2698 Equipment Datasheet

Manufacturer:	**Makita**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**LW1401**						**Equipment**	**11**		**19-3/4**		**23-5/8**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	**36**	**Front**	**36**	**Above**	**24**
								Right	**36**	**Back**	**12**	**Below**	**---**

DISCIPLINE COORDINATION:

Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**		
Structural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**		
Mechanical	---	**Venting**	Connection (inches)	**---**		
			Volume (CFM)	**---**		
Electrical	---	**Connection Size**	Requirements	**Unit**	**---**	**---**
			Voltage	**120**	**---**	**---**
			Phase	**1**	**---**	**---**
			Horsepower (HP)	**---**	**---**	**---**
			Amps	**15**	**---**	**---**
		Connection Type	**Provide standard grounded receptacle**			
Plumbing	---	**Domestic Water**	Connection (inches)	**---**		
			Flow Rate (GPM)	**---**		
			Capacity (PSI)	**---**		
		Natural Gas	Connection (inches)	**---**		
			Capacity (BTU)	**---**		
		Drain	Floor Drain (Y/N)	**N**		
		Compressed Air	Connection (inches)	**---**		
			Volume (CFM)	**---**		
			Capacity (PSI)	**---**		

Equipment Description:

Saw, cutoff, abrasive, 14 inch

EQ ID Number:

2698

2698 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Saw, cutoff, abrasive, 14 inch	**2698**

Manufacturer: Makita **Model No.:** LW1401

2740 Equipment Datasheet

Manufacturer:	**Miller Electric**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**Millermatic 141 Package (951601)**						**Equipment**	**18**		**36**		**35**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**Unit**	**---**	**---**		
								Voltage	**120**	**---**	**---**		
								Phase	**1**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**20**	**---**	**---**		
							Connection Type	**Provide standard grounded receptacle**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Welder, MIG, with cart

EQ ID Number:

2740

2740 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Welder, MIG, with cart	**2740**

Manufacturer: Miller Electric **Model No.:** Millermatic 141 Package (951601)

2742 Equipment Datasheet

Manufacturer:	**Miller Electric Manufacturing Company**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**Millermatic 252 with accessories no.:907321**						**Equipment**	**19**		**40**		**30**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---	

DISCIPLINE COORDINATION:							
Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Structural	Weight: 207 pounds	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Mechanical	---	**Venting**	Connection (inches)	**---**			
			Volume (CFM)	**---**			
Electrical	NEMA configuration: Receptacle: 6-50R Plug: 6-50P	**Connection Size**	Requirements	**Unit**	**---**	**---**	
			Voltage	**460**	**---**	**---**	
			Phase	**1**	**---**	**---**	
			Horsepower (HP)	**---**	**---**	**---**	
			Amps	**23**	**---**	**---**	
		Connection Type	**Special purpose outlet**				
Plumbing	---	**Domestic Water**	Connection (inches)	**---**			
			Flow Rate (GPM)	**---**			
			Capacity (PSI)	**---**			
		Natural Gas	Connection (inches)	**---**			
			Capacity (BTU)	**---**			
		Drain	Floor Drain (Y/N)	**N**			
		Compressed Air	Connection (inches)	**---**			
			Volume (CFM)	**---**			
			Capacity (PSI)	**---**			

Equipment Description:	**EQ ID Number:**
Welder, MIG, portable	**2742**

2742 Equipment Cutsheet

Equipment Description:		EQ ID Number:
Welder, MIG, portable		**2742**
Manufacturer:	**Miller Electric Manufacturing Company**	**Model No.:** **Millermatic 252 with accessories no.:907321**

2750 Equipment Datasheet

Manufacturer:	**Miller Electric Manufacturing Company**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**Dimension 452 (Part No.: 903254)**						**Equipment**	**38**		**23**		**30**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**Unit**	**---**	**---**		
								Voltage	**208**	**---**	**---**		
								Phase	**3**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**60**	**---**	**---**		
							Connection Type	Provide pecial purpose outlet					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Welder, multiprocess

EQ ID Number:

2750

2750 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Welder, multiprocess	**2750**

Manufacturer: Miller Electric Manufacturing Company **Model No.:** Dimension 452 (Part No.: 903254)

2760 Equipment Datasheet

Manufacturer:	**Miller Electric Manufacturing Co.**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**Syncrowave 210 Runner No. 951684**							**Equipment**	**18-1/2**		**43**		**31-1/2**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---		
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**					
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**					
Mechanical	---						**Venting**	Connection (inches)	**---**					
								Volume (CFM)	**---**					
Electrical	---						**Connection Size**	Requirements	**Unit**	**---**	**---**			
								Voltage	**120**	**---**	**---**			
								Phase	**1**	**---**	**---**			
								Horsepower (HP)	**---**	**---**	**---**			
								Amps	**20.5**	**---**	**---**			
							Connection Type	**Provide special purpose outlet**						
Plumbing	---						**Domestic Water**	Connection (inches)	**---**					
								Flow Rate (GPM)	**---**					
								Capacity (PSI)	**---**					
							Natural Gas	Connection (inches)	**---**					
								Capacity (BTU)	**---**					
							Drain	Floor Drain (Y/N)	**N**					
							Compressed Air	Connection (inches)	**---**					
								Volume (CFM)	**---**					
								Capacity (PSI)	**---**					

Equipment Description:

Welder, TIG

EQ ID Number:

2760

2760 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Welder, TIG	**2760**

Manufacturer:	Miller Electric Manufacturing Co.	Model No.:	Syncrowave 210 Runner No. 951684

2765 Equipment Datasheet

Manufacturer:	**Harris Product Group**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**4403235**						**Equipment**		**28**		**16-1/2**		**43-1/2**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**---**	**---**	**---**		
									Voltage	**---**	**---**	**---**		
									Phase	**---**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**---**	**---**	**---**		
							Connection Type		**---**					
Plumbing	---						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Torch, oxyacetylene, with cart

EQ ID Number:

2765

2765 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Torch, oxyacetylene, with cart	**2765**

Manufacturer: Harris Product Group **Model No.:** 4403235

2770 Equipment Datasheet

Manufacturer:	**Singer Safety Company**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**13-011066**						**Equipment**	**144**		**18**		**77-1/2**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Screen, welding

EQ ID Number:

2770

2770 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Screen, welding	**2770**

Manufacturer: Singer Safety Company **Model No.:** 13-011066

2780 Equipment Datasheet

Manufacturer:	**Miller Electric Company**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)		
Model No.:	**907579**							**Equipment**	**18**		**36**		**35**		
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** / **Right**	--- / ---		**Front** / **Back**	--- / ---	**Above** / **Below**	--- / ---	
DISCIPLINE COORDINATION:															
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**				
Structural	Unit weight: 56 pounds						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**				
Mechanical	---						**Venting**		Connection (inches)		**---**				
									Volume (CFM)		**---**				
Electrical	Match plug; NEMA: L6-30R twist lock						**Connection Size**		Requirements	**Motor**	**---**	**---**			
									Voltage	**240**	**---**	**---**			
									Phase	**1**	**---**	**---**			
									Horsepower (HP)	**---**	**---**	**---**			
									Amps	**27.7**	**---**	**---**			
							Connection Type		**Provide special purpose outlet**						
Plumbing	---						**Domestic Water**		Connection (inches)		**---**				
									Flow Rate (GPM)		**---**				
									Capacity (PSI)		**---**				
							Natural Gas		Connection (inches)		**---**				
									Capacity (BTU)		**---**				
							Drain		Floor Sink (Y/N)		**N**				
							Compressed Air		Connection (inches)		**3/8**				
									Volume (CFM)		**6**				
									Capacity (PSI)		**90-120**				

Equipment Description:

Cutter, plasma

EQ ID Number:

2780

2780 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Cutter, plasma	**2780**

Manufacturer: Miller Electric Company **Model No.:** 907579

2835 Equipment Datasheet

Manufacturer:	**WMH Tool Group/Wilton**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**1755**							**Equipment**	**9**		**18**		**10**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** **Right**	**36** **36**		**Front** **Back**	**36** **12**	**Above** **Below**	**24** **---**

DISCIPLINE COORDINATION:					
Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**	
Structural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**	
Mechanical	---	**Venting**	Connection (inches)	**---**	
			Volume (CFM)	**---**	
Electrical	---	**Connection Size**	Requirements	**---**	**---** **---**
			Voltage	**---**	**---** **---**
			Phase	**---**	**---** **---**
			Horsepower (HP)	**---**	**---** **---**
			Amps	**---**	**---** **---**
		Connection Type	**---**		
Plumbing	---	**Domestic Water**	Connection (inches)	**---**	
			Flow Rate (GPM)	**---**	
			Capacity (PSI)	**---**	
		Natural Gas	Connection (inches)	**---**	
			Capacity (BTU)	**---**	
		Drain	Floor Drain (Y/N)	**N**	
		Compressed Air	Connection (inches)	**---**	
			Volume (CFM)	**---**	
			Capacity (PSI)	**---**	

Equipment Description:	**EQ ID Number:**
Vise, five inch	**2835**

2835 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Vise, five inch	**2835**

Manufacturer: WMH Tool Group/Wilton **Model No.:** 1755

2880 Equipment Datasheet

Manufacturer:	**Baldor Electronics**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**8123 WD**						**Equipment**	**24-3/4**		**41**		**41-3/4**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	**24**	**Front**	**36**	**Above**	**36**
								Right	**24**	**Back**	**12**	**Below**	**---**

DISCIPLINE COORDINATION:					
Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**	
Structural	Weight grinder: 112 pounds; Dust collector: 325 pounds	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**	
Mechanical	---	**Venting**	Connection (inches)	**---**	
			Volume (CFM)	**---**	
Electrical	---	**Connection Size**	Requirements	**Grinder/ Fan**	**Dust Control** / **---**
			Voltage	**460**	**120** / **---**
			Phase	**3**	**1** / **---**
			Horsepower (HP)	**3/4**	**1** / **---**
			Amps	**1.5**	**12** / **---**
		Connection Type	**Provide disconnect**		
Plumbing	---	**Domestic Water**	Connection (inches)	**---**	
			Flow Rate (GPM)	**---**	
			Capacity (PSI)	**---**	
		Natural Gas	Connection (inches)	**---**	
			Capacity (BTU)	**---**	
		Drain	Floor Drain (Y/N)	**N**	
		Compressed Air	Connection (inches)	**---**	
			Volume (CFM)	**---**	
			Capacity (PSI)	**---**	

Equipment Description:

Buffer/grinder, eight inch, with dust collector

EQ ID Number:

2880

2880 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Buffer/grinder, eight inch, with dust collector	**2880**

Manufacturer: Baldor Electronics **Model No.:** 8123 WD

3085 Equipment Datasheet

Manufacturer:	**Trinity Tool Company (TRINCO)**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**Master 36/BP**						**Equipment**	**38**		**25**		**64**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** 24 **Right** 48		**Front** 48 **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**Unit**	**---**	**---**		
								Voltage	**120**	**---**	**---**		
								Phase	**1**	**---**	**---**		
								Horsepower (HP)	**1-1/3**	**---**	**---**		
								Amps	**9**	**---**	**---**		
							Connection Type	**Provide standard grounded receptacle**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**3/8**			
								Volume (CFM)		**25**			
								Capacity (PSI)		**60-80**			

Equipment Description:

Cabinet, abrasive blast, with dust collector

EQ ID Number:

3085

3085 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Cabinet, abrasive blast, with dust collector	**3085**

Manufacturer: Trinity Tool Company (TRINCO) **Model No.:** Master 36/BP

3275 Equipment Datasheet

Manufacturer:		**Airflow Systems, Inc.**					**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)		
Model No.:		**PCH-2**						**Equipment**	**24**		**49-1/4**		**31-1/4**		
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	---	**Front**	2	**Above**	72		
								Right	42	**Back**	2	**Below**	---		
DISCIPLINE COORDINATION:															
Architectural		---					**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**				
Structural		---					**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**				
Mechanical		---					**Venting**		Connection (inches)		**---**				
									Volume (CFM)		**---**				
Electrical		---					**Connection Size**		Requirements	**Unit**	**---**	**---**			
									Voltage	**460**	**---**	**---**			
									Phase	**3**	**---**	**---**			
									Horsepower (HP)	**3**	**---**	**---**			
									Amps	**8.4**	**---**	**---**			
							Connection Type		**Provide standard grounded receptacle**						
Plumbing		---					**Domestic Water**		Connection (inches)		**---**				
									Flow Rate (GPM)		**---**				
									Capacity (PSI)		**---**				
							Natural Gas		Connection (inches)		**---**				
									Capacity (BTU)		**---**				
							Drain		Floor Drain (Y/N)		**N**				
							Compressed Air		Connection (inches)		**3/8**				
									Volume (CFM)		**---**				
									Capacity (PSI)		**100**				

Equipment Description:

Extractor, fume, welding, portable, 1,200 CFM

EQ ID Number:

3275

3275 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Extractor, fume, welding, portable, 1,200 CFM	**3275**

Manufacturer: Airflow Systems, Inc. **Model No.:** PCH-2

3290 Equipment Datasheet

Manufacturer:	**Airflow systems Inc.**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**EZ Arm 7E14**						**Equipment**	**---**		**---**		**---**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** 12 **Below** 126	

DISCIPLINE COORDINATION:							
Architectural	Coordinate roof/wall penetration for exhaust vent piping and wall mounting of unit.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Structural	Provide roof/wall penetration of exhaust vent with mechanical; Arm shall be mounted at 10 feet, 6 inches AFF; Approximate weight 45 pounds; Coordinate size and location with mechanical; Reference Manufacturer's Design Details.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Mechanical	Provide 8 inch exhaust vent piping from exhaust fan to exterior; Coordinate with design details.	**Venting**	Connection (inches)	**8**			
			Volume (CFM)	**600 to 1,500**			
Electrical	One connection from starter to blower.	**Connection Size**	Requirements	**Unit**	---	---	
			Voltage	**460**	---	---	
			Phase	**3**	---	---	
			Horsepower (HP)	**3**	---	---	
			Amps	**3.8**	---	---	
		Connection Type	**Provide disconnect**				
Plumbing	---	**Domestic Water**	Connection (inches)	---			
			Flow Rate (GPM)	---			
			Capacity (PSI)	---			
		Natural Gas	Connection (inches)	---			
			Capacity (BTU)	---			
		Drain	Floor Drain (Y/N)	**N**			
		Compressed Air	Connection (inches)	---			
			Volume (CFM)	---			
			Capacity (PSI)	---			

Equipment Description:

Fume extraction arm, welding

EQ ID Number:

3290

3290 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Fume extraction arm, welding	**3290**

Manufacturer: Airflow systems Inc. **Model No.:** EZ Arm 7E14

E-Z Arm

Features & Benefits

- **Patented friction release pawl-and-sprocket design:** Engages positively when positioned, yet offers no resistance when removed.
- **7-, 10-, or 14-foot lengths:** Provides for high-volume collection with maximum reach.
- **Strong HDPE flat base joint:** Easy to install; HDPE bearing material works to seal base without collars or fittings.
- **Large 13-in. dia. inlet hood with 360° flange handle:** Easier hood positioning than single-handle designs.
- **Durable rounded duct constructed of 21-ga. aluminum:** Withstands industrial use, yet lightweight for easy operation. Powder coated inside and outside.
- **Hi-Flow spiral wire-reinforced hose.** Provides superior strength and resistance to sparks and embers.

Options

- **65 Watt Halogen Light Kit:** Improves worker visibility and productivity.
- **Damper:** Shut off air flow when not in use.
- **Blowers:** Several sizes available.
- **Silencer:** Reduces air flow noise for quieter operation.
- **Wall Brackets:** Maximizes installation versatility.
- **Adjustable Height Floor Stand:** Maximum height of 120 inches adds installation versatility.
- **Filtration Units:** HEPA, cartridge, and odor-control filter systems available based on application.
- **Boom Extensions:** System includes steel boom arm, boom arm wall bracket, tube kit, flex hose, and one transition to 8-in. dia.

Specifications

- **Construction:** 21 ga. aluminum tube with spiral wire-reinforced Hi-Flow hose
- **Arm Lengths:** 7 ft. (E-Z Arm® 7E07) , 10 ft. (E-Z Arm® 7E10), 14 ft. (E-Z Arm® 7E14)
- **Blower Pkgs (HP):** .75, 1.5, 3.0, 5.0, 7.5
- **Nominal Air Flow (CFM):** 600 to 1500
- **Weight (lbs.):** E-Z Arm® 7E07 - 36 lbs., E-Z Arm® 7E10 - 40 lbs., E-Z Arm® 7E14 - 45 lbs.

3300 Equipment Datasheet

Manufacturer:	**Fabricated/Makai Solutions**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)		
Model No.:	**Stainless steel mop tank with accessories**						**Equipment**		**40**		**25**		**42**		
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**		**Left** 36 **Right** 36		**Front** 36 **Back** 36		**Above** 36 **Below** 0		
DISCIPLINE COORDINATION:															
Architectural	Coordinate floor sink locations per Design Details.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**Y**				
Structural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**Y**				
Mechanical	---						**Venting**		Connection (inches)		**---**				
									Volume (CFM)		**---**				
Electrical	---						**Connection Size**		Requirements	**---**	**---**	**---**			
									Voltage	**---**	**---**	**---**			
									Phase	**---**	**---**	**---**			
									Horsepower (HP)	**---**	**---**	**---**			
									Amps	**---**	**---**	**---**			
							Connection Type		**---**						
Plumbing	Provide faucet: Hot and cold water supply; Drain: 1-1/2 inches; Provide fabricated support for plumbing fixtures and hot and cold water supply; Reference Design Details.						**Domestic Water**		Connection (inches)		**3/4**				
									Flow Rate (GPM)		**3.5**				
									Capacity (PSI)		**---**				
							Natural Gas		Connection (inches)		**---**				
									Capacity (BTU)		**---**				
							Drain		Floor Sink (Y/N)		**Y**				
							Compressed Air		Connection (inches)		**---**				
									Volume (CFM)		**---**				
									Capacity (PSI)		**---**				

Equipment Description:

Tank, mop, with wringer

EQ ID Number:

3300

3300 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Tank, mop, with wringer	**3300**

Manufacturer:	Fabricated/Makai Solutions	Model No.:	Stainless steel mop tank with accessories

3540 Equipment Datasheet

Manufacturer:	**Graymills**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**PL36-A with accessories**						**Equipment**		**36**		**22**		**38-1/2**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	**6**	**Front**	**36**	**Above**	**24**
								Right	**6**	**Back**	**6**	**Below**	**---**

DISCIPLINE COORDINATION:

Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Structural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Mechanical	---	**Venting**	Connection (inches)	**---**			
			Volume (CFM)	**---**			
Electrical	---	**Connection Size**	Requirements	**Unit**	**---**	**---**	
			Voltage	**120**	**---**	**---**	
			Phase	**1**	**---**	**---**	
			Horsepower (HP)	**1/5**	**---**	**---**	
			Amps	**1.04**	**---**	**---**	
		Connection Type	**Provide standard grounded receptacle**				
Plumbing	---	**Domestic Water**	Connection (inches)	**---**			
			Flow Rate (GPM)	**---**			
			Capacity (PSI)	**---**			
		Natural Gas	Connection (inches)	**---**			
			Capacity (BTU)	**---**			
		Drain	Floor Drain (Y/N)	**N**			
		Compressed Air	Connection (inches)	**---**			
			Volume (CFM)	**---**			
			Capacity (PSI)	**---**			

Equipment Description:

Tank, parts cleaning, 15 gallon

EQ ID Number:

3540

3540 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Tank, parts cleaning, 15 gallon	**3540**

Manufacturer: Graymills **Model No.:** PL36-A with accessories

3555 Equipment Datasheet

Manufacturer:	**Better Engineering**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**F-3000-P with accessories**						**Equipment**	**50**		**62**		**69**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** 36 **Right** 36		**Front** 48 **Back** 12		**Above** 24 **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	Coordinate exterior penetration size and location of steam vent with mechanical.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Coordinate exterior penetration size and location of steam vent with mechanical.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	Steam exhaust: Vent PVC steam exhaust to exterior						**Venting**	Connection (inches)		**4**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**Unit**	**---**	**---**		
								Voltage	**460**	**---**	**---**		
								Phase	**3**	**---**	**---**		
								Horsepower (HP)	**5**	**---**	**---**		
								Amps	**43**	**---**	**---**		
							Connection Type	**Provide disconnect**					
Plumbing	Provide back flow device.						**Domestic Water**	Connection (inches)		**1/2**			
								Flow Rate (GPM)		**10 to 12**			
								Capacity (PSI)		**50 to 150**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain or Floor Sink (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Washer, parts, automatic, front load

EQ ID Number:

3555

3555 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Washer, parts, automatic, front load	**3555**

Manufacturer: Better Engineering **Model No.:** F-3000-P with accessories

3610 Equipment Datasheet

Manufacturer:	**J.E. Adams Industries**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)		
Model No.:	**9235-3 with accessories**						**Equipment**		**20-1/8**		**26**		**52**		
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left**	**24**	**Front**	**24**	**Above**	**---**	
									Right	**24**	**Back**	**6**	**Below**	**---**	
DISCIPLINE COORDINATION:															
Architectural	Column mounted or on steel reinforced housekeeping pad at desired height of owner; Must be at least 20 feet from outside face of any fuel dispenser. [Project specific]						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**Y**				
Structural	Column mounted or on steel reinforced housekeeping pad a minimum of 18 inches. [Project specific]						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**Y**				
Mechanical	---						**Venting**		Connection (inches)		**---**				
									Volume (CFM)		**---**				
Electrical	Requires a dedicated circuit and hardwire connection.						**Connection Size**		Requirements	**Motor**	**---**	**---**			
									Voltage	**120**	**---**	**---**			
									Phase	**1**	**---**	**---**			
									Horsepower (HP)	**4.8**	**---**	**---**			
									Amps	**30**	**---**	**---**			
							Connection Type		**Provide j-box**						
Plumbing	---						**Domestic Water**		Connection (inches)		**---**				
									Flow Rate (GPM)		**---**				
									Capacity (PSI)		**---**				
							Natural Gas		Connection (inches)		**---**				
									Capacity (BTU)		**---**				
							Drain		Floor Drain (Y/N)		**N**				
							Compressed Air		Connection (inches)		**---**				
									Volume (CFM)		**---**				
									Capacity (PSI)		**---**				

Equipment Description:

Vacuum, canister, stainless steel

EQ ID Number:

3610

3610 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Vacuum, canister, stainless steel	**3610**

Manufacturer: J.E. Adams Industries **Model No.:** 9235-3 with accessories

3718 Equipment Datasheet

Manufacturer:	**Hotsy Corporation**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**945N with accessories**						**Equipment**	**47-1/2**		**21**		**51**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	**36**	**Front**	**36**	**Above**	**48**
								Right	**36**	**Back**	**36**	**Below**	**0**

DISCIPLINE COORDINATION:								
Architectural	Coordinate roof penetration with equipment, mechanical, and structural.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**Y**				
Structural	Coordinate roof penetration size and location of exhaust vent with mechanical and architectural; Weight of unit: 545 pounds; Reference Design Details.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**Y**				
Mechanical	If enclosed, provide louvered opening sized according to combustion air requirements and NFPA54; Provide exhaust stack through the roof; Draft diverter supplied by manufacturer; Reference Design Details.	**Venting**	Connection (inches)	**8**				
			Volume (CFM)	**---**				
Electrical	Reference Design Details.	**Connection Size**	Requirements	**Unit**	**---**	**---**		
			Voltage	**460**	**---**	**---**		
			Phase	**3**	**---**	**---**		
			Horsepower (HP)	**5**	**---**	**---**		
			Amps	**8**	**---**	**---**		
		Connection Type	**Provide disconnect**					
Plumbing	Water supply terminates at standard hose bibb; Provide gas regulator; Reference Design Details.	**Domestic Water**	Connection (I.D. inches)	**5/8**				
			Flow Rate (GPM)	**4**				
			Capacity (PSI)	**30**				
		Natural Gas	Connection (inches)	**3/4**				
			Capacity (BTU/Hr)	**365,000**				
			Gas Pressure (W.C.I)	**9 to 14**				
		Drain	Floor Drain (Y/N)	**N**				
		Compressed Air	Connection (inches)	**---**				
			Volume (CFM)	**---**				
			Capacity (PSI)	**---**				

Equipment Description:

Washer, high pressure, hot water, NG, 4 GPM

EQ ID Number:

3718

3718 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Washer, high pressure, hot water, NG, 4 GPM	**3718**

Manufacturer: Hotsy Corporation **Model No.:** 945N with accessories

3834 Equipment Datasheet

Manufacturer:	**Interclean Equipment**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**Four brush and touchless hybrid #LY16-042 with accessories**						**Equipment**	**1020**		**192**		**170**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---	

DISCIPLINE COORDINATION:									
Architectural	Settling pit in wash bay; Floor slopes at 1/4 inch per foot; Coordinate with overhead door clearances; Vehicle wash pumps to be mounted on housekeeping pad.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**Y**					
Structural	Provide cast in place settling pit per manufacturer's design details in wash bay with water stops to prevent water leaking out of sump; Vehicle wash pumps to be mounted on housekeeping pad.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**Y**					
Mechanical	Coordinate 6 inch exhaust flue through roof from the water heater.	**Venting**	Connection (inches)	**6**					
			Volume (CFM)	**---**					
Electrical	---	**Connection Size**	Requirements	---	---	---	---		
			Voltage	**---**	**---**	**---**	**---**		
			Phase	**---**	**---**	**---**	**---**		
			Horsepower (HP)	**---**	**---**	**---**	**---**		
			Amps	**---**	**---**	**---**	**---**		
		Connection Type	**---**						
Plumbing	---	**Domestic Water**	Connection (inches)	**2**					
			Flow Rate (GPM)	**---**					
			Capacity (PSI)	**30 to 80**					
		Natural Gas	Connection (inches)	**3/4**					
			Capacity (BTU)	**199000**					
		Drain	Floor Drain (Y/N)	**Y**					
		Compressed Air	Connection (inches)	**---**					
			Volume (CFM)	**---**					
			Capacity (PSI)	**---**					

Equipment Description:	**EQ ID Number:**
Washer, bus, drive through, four brush	**3834**

3834 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Washer, bus, drive through, four brush	**3834**

Manufacturer:	Interclean Equipment	Model No.:	Four brush and touchless hybrid #LY16-042 with accessories

5010 Equipment Datasheet

Manufacturer:	**Kone Cranes, Inc**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**Model #**						**Equipment**	**0**		**0**		**0**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**	**Left** 6 **Right** 6		**Front** 6 **Back** 6		**Above** 6 **Below** 6	
DISCIPLINE COORDINATION:													
Architectural	Coordinate OSHA clearances, overhead door clearances ducting clearances, process piping, routing with mechanical and design with structural.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Coordinate beam size clearances, and mounting details for crane rails per manufacturer's drawings.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	Coordinate ducting and HVAC equipment with architectural to avoid conflicts with the operation of the bridge crane.						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	Provide power through disconnect to the support beam.						**Connection Size**	Requirements	**Unit**	**---**	**---**		
								Voltage	**460**	**---**	**---**		
								Phase	**3**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**35**	**---**	**---**		
							Connection Type	**Provide disconnect**					
Plumbing	Coordinate piping with architect to avoid conflicts with the operation of the bridge crane.						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Sink (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Crane, bridge, top running, 5 ton

EQ ID Number:

5010

5010 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Crane, bridge, top running, 5 ton	**5010**

Manufacturer: Kone Cranes, Inc **Model No.:** Model #

5404 Equipment Datasheet

Manufacturer:	**Clark Material Handling Company**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**NPX 20 with accessories**						**Equipment**		**93**		**40-1/4**		**95**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** 0 **Right** 0		**Front** 0 **Back** 0		**Above** 0 **Below** 0	
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Weight of battery charger: 159 pounds.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	Provide dedicated circuit.						**Connection Size**		Requirements	**Battery Charger**	**---**	**---**		
									Voltage	**460**	**---**	**---**		
									Phase	**3**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**13.5**	**---**	**---**		
							Connection Type		**Provide disconnect**					
Plumbing	---						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Forklift, electric, 4,000 pound, stand up

EQ ID Number:

5404

5404 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Forklift, electric, 4,000 pound, stand up	**5404**

Manufacturer: Clark Material Handling Company **Model No.:** NPX 20 with accessories

5410 Equipment Datasheet

Manufacturer:	**Clark Material Handling Company**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**GEX 50**						**Equipment**		**127-3/4**		**58-3/4**		**91**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Weight of battery charger is 380 pounds.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**Charger**	**---**	**---**		
									Voltage	**480**	**---**	**---**		
									Phase	**3**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**13-1/2**	**---**	**---**		
							Connection Type		**Provide Disconnect**					
Plumbing	---						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Forklift, electric, 10,000 pound

EQ ID Number:

5410

5410 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Forklift, electric, 10,000 pound	**5410**

Manufacturer: Clark Material Handling Company **Model No.:** GEX 50

5420 Equipment Datasheet

Manufacturer:	**Clark Material Handling Co.**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**C50S**						**Equipment**	**175**		**69**		**90-1/2**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 36 **Back** 36		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Forklift, 10,000 pound, LPG

EQ ID Number:

5420

5420 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Forklift, 10,000 pound, LPG	**5420**

Manufacturer: Clark Material Handling Co. **Model No.:** C50S

5558 Equipment Datasheet

Manufacturer:	**LPI Lift Systems**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**TK 48-S with accessories**							**Equipment**	**138**		**63**		**58**	
								Platform	**120**		**41**		**---**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**	**Left**	**4-1/2**	**Right**	**4-1/2**	**Front**	**4-1/2**	**Back**	**4-1/2**	**Above** **48** **Below** **0**

DISCIPLINE COORDINATION:						
Architectural	Minimum 6 feet clear width in lower level work area below pit opening. Coordinate/verify location of systems are not in equipment path of travel or within lifting clearances.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**		
Structural	Coordinate with design details. Coordinate/verify location of systems are not in equipment path of travel or within lifting clearances.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**		
Mechanical	Coordinate/verify location of systems are not in equipment path of travel or within lifting clearances.	**Venting**	Connection (inches)	**---**		
			Volume (CFM)	**---**		
Electrical	Coordinate location of electric with equipment; Electrical connection wired into light- no plug (explosion proof).	**Connection Size**	Requirements	**Lighting**	**---**	**---**
			Voltage	**120**	**---**	**---**
			Phase	**1**	**---**	**---**
			Horsepower (HP)	**---**	**---**	**---**
			Amps	**4**	**---**	**---**
		Connection Type	**Provide j-box**			
Plumbing	Coordinate/verify location of systems are not in equipment path of travel or within lifting clearances.	**Domestic Water**	Connection (inches)	**---**		
			Flow Rate (GPM)	**---**		
			Capacity (PSI)	**---**		
		Natural Gas	Connection (inches)	**---**		
			Capacity (BTU)	**---**		
		Drain	Floor Drain (Y/N)	**N**		
		Compressed Air	Connection (inches)	**1/2**		
			Volume (CFM)	**50**		
			Capacity (PSI)	**90**		

Equipment Description:

Lift, man, mobile, LLWA

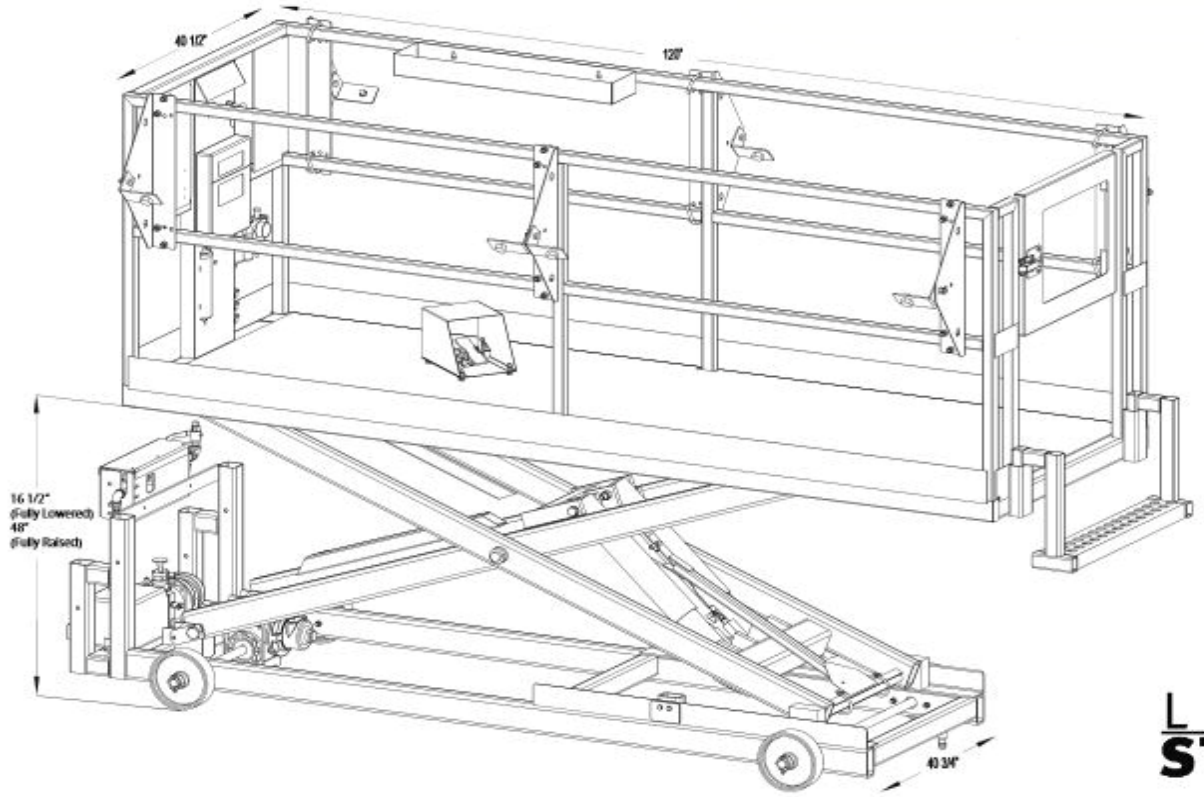
EQ ID Number:

5558

5558 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Lift, man, mobile, LLWA	**5558**

Manufacturer: LPI Lift Systems **Model No.:** TK 48-S with accessories



LPI STRONG®

5630 Equipment Datasheet

Manufacturer:	**Rotary Lifts**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**MOD335 with accessories**						**Equipment**	**25-3/8**		**14-1/4**		**32-7/8**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	Coodinate foundation design with structural; Reference Design Details.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Provide note to reference approved manufacturer shop drawings prior to construction; Provide foundation details for lift per Design Details.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	Provide 2 inch conduits from control cabinet to lift; Reference approved manufacturer shop drawings; Provide two 2 inch conduits from disconnect to control panel.						**Connection Size**	Requirements	**Unit**	**---**	**---**		
								Voltage	**460**	**---**	**---**		
								Phase	**3**	**---**	**---**		
								Horsepower (HP)	**5**	**---**	**---**		
								Amps	**28**	**---**	**---**		
							Connection Type	**Provide disconnect**					
Plumbing	Provide drain for liquid evacuation system; Provide filter/regulator/lubricator to lift control panel; Reference Design Details.						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Drain (Y/N)		**N**			
							Compressed Air	Connection (inches)		**1/2**			
								Volume (CFM)		**5**			
								Capacity (PSI)		**90 to 110**			

Equipment Description:

Lift, axle, three post, 105,000 pound, shallow design

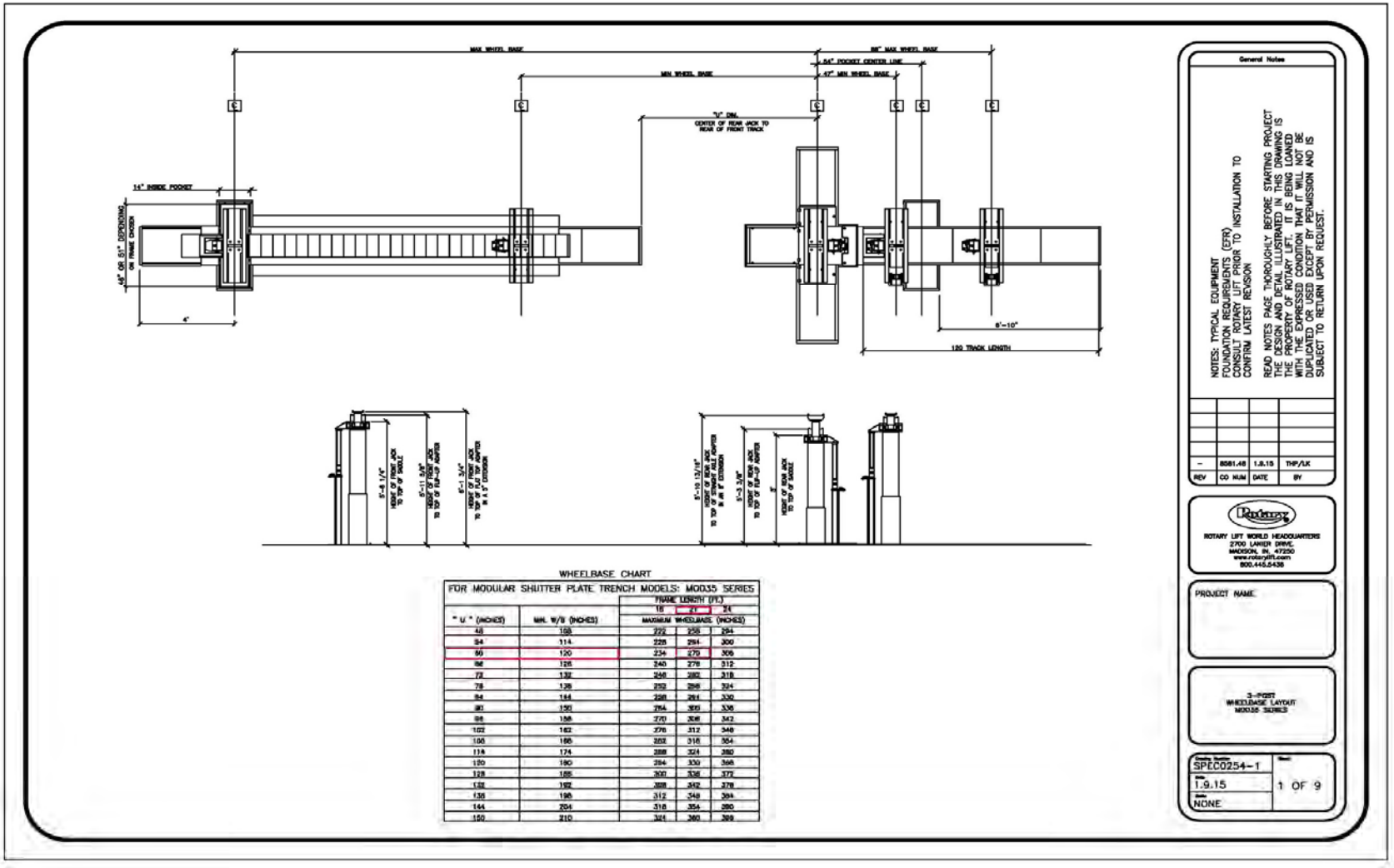
EQ ID Number:

5630

5630 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Lift, axle, three post, 105,000 pound, shallow design	**5630**

Manufacturer: Rotary Lifts **Model No.:** MOD335 with accessories



5645 Equipment Datasheet

Manufacturer:	**Rotary Lift**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**75/48-F with accessories**						**Equipment**		**576**		**112**		**63**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	N	**Operational Clearance**	**Left** / **Right**	--- / ---		**Front** / **Back**	--- / ---	**Above** / **Below**	--- / ---

DISCIPLINE COORDINATION:							
Architectural	Coordinate with overhead door clearances; Control panel mounted on housekeeping pad; Coordinate conduit in slab from controls to lift.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**Y**			
Structural	Pits and other concrete work shall be provided per design details; Housekeeping pad shall be sized for equipment console.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**Y**			
Mechanical	---	**Venting**	Connection (inches)	---			
			Volume (CFM)	---			
Electrical	Provide disconnect near controls; provide two inch conduit in slab from controls to the lift; Coordinate with design details.	**Connection Size**	Requirements	**Unit**	---	---	
			Voltage	**460**	---	---	
			Phase	**3**	---	---	
			Horsepower (HP)	**20**	---	---	
			Amps	---	---	---	
		Connection Type	**Provide disconnect**				
Plumbing	Provide floor drain in each lift recess; Coordinate with design details.	**Domestic Water**	Connection (inches)	---			
			Flow Rate (GPM)	---			
			Capacity (PSI)	---			
		Natural Gas	Connection (inches)	---			
			Capacity (BTU)	---			
		Drain	Floor Drain (Y/N)	**N**			
		Compressed Air	Connection (inches)	**1/2**			
			Volume (CFM)	**5**			
			Capacity (PSI)	**120**			

Equipment Description:

Lift, parallelogram, 75,000 pounds, 48 feet

EQ ID Number:

5645

5645 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Lift, parallelogram, 75,000 pounds, 48 feet	**5645**

Manufacturer: Rotary Lift **Model No.:** 75/48-F with accessories

Surface in recessed mount

Model:	75/48-S 75/48-F
Rise*	63" (1600mm)
Lifting Capacity	75,000 lbs. (34000kg)
Length Platform	48' (14630mm)
Length Overall	56' 3 3/16" (17150mm) 48' (14630mm)
Width Platform	32" (813mm)
Width Overall	109" (2769mm)
Height Retracted	12 7/8" (327mm) Flush
Motor	20hp
Number of Legs	8
Min. Floor Thickness	6 3/4" (152mm) 9" (229mm)

* Rise is calculated from

5692 Equipment Datasheet

Manufacturer:	**Stertil-Koni**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**ECO90 with accessories**							**Equipment**	**---**		**66**		**---**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y		**Operational Clearance**	**Left** 160 **Right** 160		**Front** 120 **Back** 120		**Above** 228 **Below** ---	
DISCIPLINE COORDINATION:														
Architectural	Coordinate foundation requirements with structural. Mount control console on housekeeping pad. Refer to Design Details for size and location of concrete block out service opening.							**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**Y**			
Structural	Concrete work shall be per manufacturer's shop drawings for a complete flush with floor installation; Control console on housekeeping pad.							**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**Y**			
Mechanical	---							**Venting**	Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	Provide fused disconnect on wall or column near control console; Provide conduit under slab between disconnect and control console and between console and lift; Reference Design Details.							**Connection Size**	Requirements	**Unit**	**---**	**---**		
									Voltage	**460**	**---**	**---**		
									Phase	**3**	**---**	**---**		
									Horsepower (HP)	**15**	**---**	**---**		
									Amps	**13**	**---**	**---**		
								Connection Type	**Provide disconnect**					
Plumbing	Provide 2 inch conduit in slab from adjacent wall to control console for compressed air; Provide floor drain in each pit; Reference Design Details.							**Domestic Water**	Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
								Natural Gas	Connection (inches)		**---**			
									Capacity (BTU)		**---**			
								Drain	Floor Drain (Y/N)		**Y**			
								Compressed Air	Connection (inches)		**1/4**			
									Volume (CFM)		**5**			
									Capacity (PSI)		**60**			

Equipment Description:

Lift, axle, scissor, adjustable, 90,000 pound

EQ ID Number:

5692

5692 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Lift, axle, scissor, adjustable, 90,000 pound	**5692**

Manufacturer: Stertil-Koni **Model No.:** ECO90 with accessories

7520 Equipment Datasheet

Manufacturer:	**Graco, Inc.**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**425 Fire-Ball**						**Equipment**		**8 dia.**		**---**		**28-1/2**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	**12**	**Front**	**12**	**Above**	**18**
								Right	**12**	**Back**	**12**	**Below**	**---**

DISCIPLINE COORDINATION:							
Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Structural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Mechanical	---	**Venting**	Connection (inches)	**---**			
			Volume (CFM)	**---**			
Electrical	---	**Connection Size**	Requirements	**---**	**---**	**---**	
			Voltage	**---**	**---**	**---**	
			Phase	**---**	**---**	**---**	
			Horsepower (HP)	**---**	**---**	**---**	
			Amps	**---**	**---**	**---**	
		Connection Type	**---**				
Plumbing	---	**Domestic Water**	Connection (inches)	**---**			
			Flow Rate (GPM)	**---**			
			Capacity (PSI)	**---**			
		Natural Gas	Connection (inches)	**---**			
			Capacity (BTU)	**---**			
		Drain	Floor Drain (Y/N)	**N**			
		Compressed Air	Connection (inches)	**1/2 NPT(F)**			
			Volume (CFM)	**24**			
			Capacity (PSI)	**100**			

Equipment Description:	**EQ ID Number:**
Pump, air piston, 10:1 ratio (commodity)	**7520**

7520 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Pump, air piston, 10:1 ratio (commodity)	**7520**

Manufacturer: Graco, Inc. **Model No.:** 425 Fire-Ball

7531 Equipment Datasheet

Manufacturer:	**Graco, Inc.**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**647016 for water/antifreeze, 647731 for OH**						**Equipment**		**14-3/4**		**10-1/4**		**16**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** 12 **Right** 12		**Front** 12 **Back** ---		**Above** 18 **Below** 12	
DISCIPLINE COORDINATION:														
Architectural	Coordinate wall mounting of pump above tank.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Coordinate wall mounting of pump above tank. Weight: 23 pounds.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**---**	**---**	**---**		
									Voltage	**---**	**---**	**---**		
									Phase	**---**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**---**	**---**	**---**		
							Connection Type		**---**					
Plumbing	Plumb to reel banks; Provide compressed air from main compressed air loop.						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain or Floor Sink (Y/N)		**N**			
							Compressed Air		Connection (inches)		**1/2**			
									Volume (CFM)		**67**			
									Capacity (PSI)		**100**			

Equipment Description:

Pump, diaphragm, non-mixing (EC)

EQ ID Number:

7531

7531 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Pump, diaphragm, non-mixing (EC)	**7531**

Manufacturer:	Graco, Inc.	Model No.:	647016 for water/antifreeze, 647731 for OH

7541 Equipment Datasheet

Manufacturer:	**Graco, Inc.**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**24E166 with accessories**							**Equipment**	**14-3/4**		**10-3/4**		**16**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N		**Operational Clearance**	**Left** 12 **Right** 12		**Front** 12 **Back** ---		**Above** 18 **Below** 12	
DISCIPLINE COORDINATION:														
Architectural	Coordinate mounting of pump.							**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---							**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---							**Venting**	Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	Route control wiring in conduit between fluid monitoring system and solenoid valve and strobe at corresponding extraction pump; Provide dedicated outlet adjacent to unit.							**Connection Size**	Requirements	**Unit**	**---**	**---**		
									Voltage	**120**	**---**	**---**		
									Phase	**1**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**2**	**---**	**---**		
								Connection Type	**Provide standard grounded receptacle**					
Plumbing	Plumb to used fluid tank; Provide compressed air from main compressed air loop.							**Domestic Water**	Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
								Natural Gas	Connection (inches)		**---**			
									Capacity (BTU)		**---**			
								Drain	Floor Drain (Y/N)		**N**			
								Compressed Air	Connection (inches)		**1/2**			
									Volume (CFM)		**67**			
									Capacity (PSI)		**100**			

Equipment Description:

Pump, diaphragm, used fluid evacuation (UC)

EQ ID Number:

7541

7541 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Pump, diaphragm, used fluid evacuation (UC)	**7541**

Manufacturer: Graco, Inc. **Model No.:** 24E166 with accessories

7575 Equipment Datasheet

Manufacturer:	**Graco Incorporated**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**220592 and 247713 with accessories**						**Equipment**		**2**		**2**		**10**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**		**Left** 12 **Right** 12		**Front** 12 **Back** 12		**Above** 12 **Below** 12	
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	---						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**---**	**---**	**---**		
									Voltage	**---**	**---**	**---**		
									Phase	**---**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**---**	**---**	**---**		
							Connection Type		**---**					
Plumbing	Plumbed to tank in Lube Room.						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Hose and dispenser (GO)

EQ ID Number:

7575

7575 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Hose and dispenser (GO)	**7575**

Manufacturer:	Graco Incorporated	Model No.:	220592 and 247713 with accessories

7710 Equipment Datasheet

Manufacturer:	**Graco, Inc.**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**XD Series**						**Equipment**	**---**		**---**		**---**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**	**Left** **Right**	**3-1/2** **3-1/2**	**Front** **Back**	**48** **48**	**Above** **Below**	**---** **---**

DISCIPLINE COORDINATION:

Architectural	Coordinate mounting of reel banks with structural.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Structural	Reel bank shall be hung from a structural frame with mounting plate at 16 feet AFF; Weight approximately 100 pounds; Reference Equipment Drawing Details.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**			
Mechanical	---	**Venting**	Connection (inches)	**---**			
			Volume (CFM)	**---**			
Electrical	---	**Connection Size**	Requirements	**---**	**---**	**---**	
			Voltage	**---**	**---**	**---**	
			Phase	**---**	**---**	**---**	
			Horsepower (HP)	**---**	**---**	**---**	
			Amps	**---**	**---**	**---**	
		Connection Type	**---**				
Plumbing	Plumb to lube/compressor room.	**Domestic Water**	Connection (inches)	**---**			
			Flow Rate (GPM)	**---**			
			Capacity (PSI)	**---**			
		Natural Gas	Connection (inches)	**---**			
			Capacity (BTU)	**---**			
		Drain	Floor Drain (Y/N)	**N**			
		Compressed Air	Connection (inches)	**---**			
			Volume (CFM)	**---**			
			Capacity (PSI)	**---**			

Equipment Description:

Reel bank (CA)

EQ ID Number:

7710

7710 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Reel bank (CA)	**7710**

Manufacturer: Graco, Inc. **Model No.:** XD Series

7780 Equipment Datasheet

Manufacturer:	**Graco, Inc.**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**XD Series**						**Equipment**		---		---		---	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**	**Left** / **Right**	**3-1/2** / **3-1/2**	**Front** / **Back**	**48** / **48**	**Above** / **Below**	**---** / **168**	
DISCIPLINE COORDINATION:														
Architectural	Coordinate mounting of reel banks with structural.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Reel bank shall be hung from a structural frame with mounting plate at 16 feet AFF; Weight approximately 800 pounds; Reference Design Details.						**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**		Connection (inches)		**---**			
									Volume (CFM)		**---**			
Electrical	---						**Connection Size**		Requirements	**---**	**---**	**---**		
									Voltage	**---**	**---**	**---**		
									Phase	**---**	**---**	**---**		
									Horsepower (HP)	**---**	**---**	**---**		
									Amps	**---**	**---**	**---**		
							Connection Type		**---**					
Plumbing	Plumb to lube/compressor room.						**Domestic Water**		Connection (inches)		**---**			
									Flow Rate (GPM)		**---**			
									Capacity (PSI)		**---**			
							Natural Gas		Connection (inches)		**---**			
									Capacity (BTU)		**---**			
							Drain		Floor Drain (Y/N)		**N**			
							Compressed Air		Connection (inches)		**---**			
									Volume (CFM)		**---**			
									Capacity (PSI)		**---**			

Equipment Description:

Reel bank (CA, diff. GO1, GO2, H2O, CO, Power Steering PS. future)

EQ ID Number:

7780

7780 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Reel bank (CA, diff. GO1, GO2, H2O, CO, Power Steering PS. future)	**7780**

Manufacturer: Graco, Inc. **Model No.:** XD Series

7907 Equipment Datasheet

Manufacturer:	**Snyder Industries**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**5740100N**						**Equipment**	**47 dia.**		**---**		**58-1/2**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** 48 **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Structural	Approx. wet weight (water): 2,296 pounds. Approx. dry weight: 96 pounds.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**N**			
Mechanical	---						**Venting**	Connection (inches)		**---**			
								Volume (CFM)		**---**			
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**		
								Voltage	**---**	**---**	**---**		
								Phase	**---**	**---**	**---**		
								Horsepower (HP)	**---**	**---**	**---**		
								Amps	**---**	**---**	**---**		
							Connection Type	**---**					
Plumbing	---						**Domestic Water**	Connection (inches)		**---**			
								Flow Rate (GPM)		**---**			
								Capacity (PSI)		**---**			
							Natural Gas	Connection (inches)		**---**			
								Capacity (BTU)		**---**			
							Drain	Floor Sink (Y/N)		**N**			
							Compressed Air	Connection (inches)		**---**			
								Volume (CFM)		**---**			
								Capacity (PSI)		**---**			

Equipment Description:

Tank, double wall, polyethylene, 275 gallon (commodity)

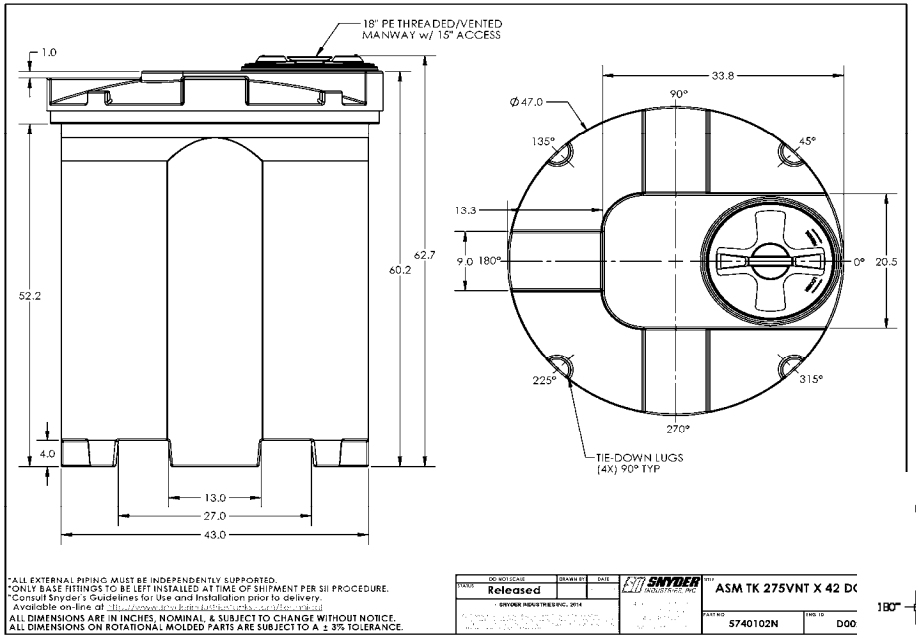
EQ ID Number:

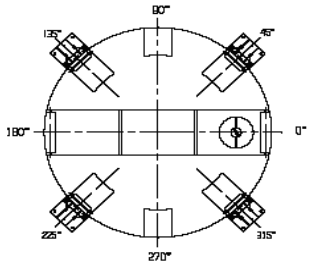
7907

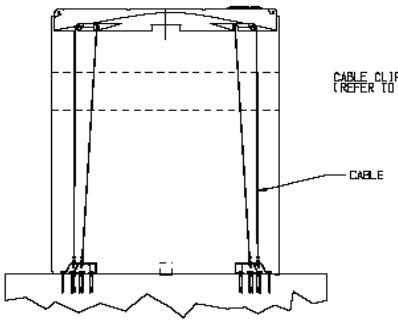
7907 Equipment Cutsheet

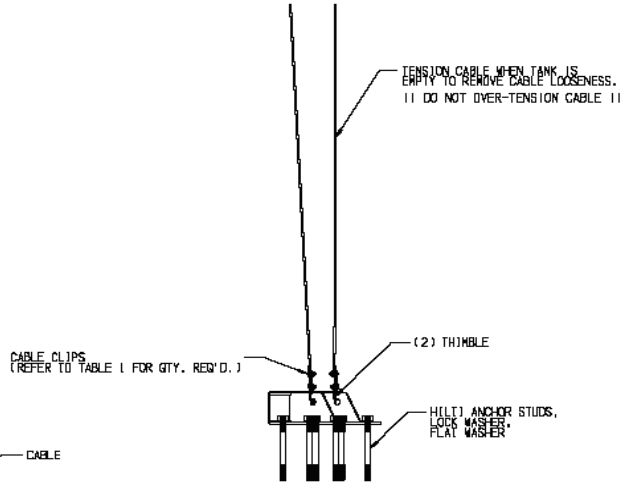
Equipment Description:	EQ ID Number:
Tank, double wall, polyethylene, 275 gallon (commodity)	**7907**

Manufacturer: Snyder Industries **Model No.:** 5740100N









7970 Equipment Datasheet

Manufacturer:	**Containment Solutions, Incorporated**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**LC500DW with accessories**							**Equipment**	**61**		**46**		**61**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	**6**	**Front**	**72**	**Above**	**48**
								Right	**6**	**Back**	**6**	**Below**	**0**

DISCIPLINE COORDINATION:					
Architectural	---	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**	
Structural	Dry Weight: 1,350 pounds; Filled Weight: 11,273 pounds; Anchored at tabs; anchor size by Structural Engineer	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**	
Mechanical	Provide venting to exterior [for used fluid tanks only].	**Venting**	Connection (inches)	**2**	
			Volume (CFM)	**---**	
Electrical	[For UO/UC tanks only with Fluid Management System] Control wiring between Fluid Monitoring System and solenoid valve at corresponding extraction pump; Route all wiring in conduit; Provide outlet(s) on wall above tank for alarm or Fluid Management System (FMS), pump air control (PAC); Control wiring between FMS and tank; Route in conduit.	**Connection Size**	Requirements	**PAC**	**Alarm** / **FMS**
			Voltage	**120**	**120** / **120**
			Phase	**1**	**1** / **1**
			Horsepower (HP)	**---**	**---** / **---**
			Amps	**2**	**---** / **1**
		Connection Type	**Receptacle, Standard Grounded**		
Plumbing	Plumb to corresponding overhead reels/used fluid pumps.	**Domestic Water**	Connection (inches)	**---**	
			Flow Rate (GPM)	**---**	
			Capacity (PSI)	**---**	
		Natural Gas	Connection (inches)	**---**	
			Capacity (BTU)	**---**	
		Drain	Floor Sink (Y/N)	**N**	
		Compressed Air	Connection (inches)	**1/2**	
			Volume (CFM)	**60**	
			Capacity (PSI)	**50**	

Equipment Description:

Tank, double wall, cube, 500 gallon (commodity)

EQ ID Number:

7970

7970 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Tank, double wall, cube, 500 gallon (commodity)	**7970**

Manufacturer: Containment Solutions, Incorporated **Model No.:** LC500DW with accessories

7993 Equipment Datasheet

Manufacturer:	**Graco Incorporated**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**218 969 with accessories**							**Equipment**	**33**		**24**		**11**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** 6 **Right** 6		**Front** 36 **Back** 6		**Above** 2 **Below** 12		

DISCIPLINE COORDINATION:

Architectural	Coordinate clearances and design with structural. Drain pan shall travel on rails the complete length of pit and store at end of pit under a steel plate flush with the finished floor.; rails must be 2-1/2 inches wide to support drain pan wheels for travel on.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**				
Structural	Drain pan shall travel on rails the complete length of pit and store at end of pit under a steel plate flush with the finished floor.; rails must be 2-1/2 inches wide to support drain pan wheels for travel on.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**				
Mechanical	---	**Venting**	Connection (inches)	---				
			Volume (CFM)	---				
Electrical	---	**Connection Size**	Requirements	---	---	---		
			Voltage	---	---	---		
			Phase	---	---	---		
			Horsepower (HP)	---	---	---		
			Amps	---	---	---		
		Connection Type	---					
Plumbing	---	**Domestic Water**	Connection (inches)	---				
			Flow Rate (GPM)	---				
			Capacity (PSI)	---				
		Natural Gas	Connection (inches)	---				
			Capacity (BTU)	---				
		Drain	Floor Sink (Y/N)	**N**				
		Compressed Air	Connection (inches)	---				
			Volume (CFM)	---				
			Capacity (PSI)	---				

Equipment Description:

Drain pan, rolling (UC)

EQ ID Number:

7993

7993 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Drain pan, rolling (UC)	**7993**

Manufacturer: Graco Incorporated **Model No.:** 218 969 with accessories

7995 Equipment Datasheet

Manufacturer:	**Graco, Incorporated**							**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)			
Model No.:	**248632**							**Equipment**		**24**		**24**		**45**			
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N		**Operational Clearance**		**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** 30 **Below** ---			
DISCIPLINE COORDINATION:																	
Architectural	---							**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**					
Structural	---							**Housekeeping Pad**		Mounted 6 inch high, steel reinforced (Y/N)		**N**					
Mechanical	---							**Venting**		Connection (inches)		**---**					
										Volume (CFM)		**---**					
Electrical	---							**Connection Size**		Requirements	**---**	**---**	**---**				
										Voltage	**---**	**---**	**---**				
										Phase	**---**	**---**	**---**				
										Horsepower (HP)	**---**	**---**	**---**				
										Amps	**---**	**---**	**---**				
								Connection Type		**---**							
Plumbing	3/4" pump connection							**Domestic Water**		Connection (inches)		**---**					
										Flow Rate (GPM)		**---**					
										Capacity (PSI)		**---**					
								Natural Gas		Connection (inches)		**---**					
										Capacity (BTU)		**---**					
								Drain		Floor Drain (Y/N)		**N**					
								Compressed Air		Connection (inches)		**---**					
										Volume (CFM)		**---**					
										Capacity (PSI)		**---**					

Equipment Description:

Receiver, 25 gallon, portable (UC)

EQ ID Number:

7995

7995 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Receiver, 25 gallon, portable (UC)	**7995**

Manufacturer: Graco, Incorporated **Model No.:** 248632

7996 Equipment Datasheet

Manufacturer:	**Graco, Incorporated.**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**238866**							**Equipment**	**24**		**24**		**45**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** 30 **Below** ---		
DISCIPLINE COORDINATION:														
Architectural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**					
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**					
Mechanical	---						**Venting**	Connection (inches)	**---**					
								Volume (CFM)	**---**					
Electrical	---						**Connection Size**	Requirements	**---**	**---**	**---**			
								Voltage	**---**	**---**	**---**			
								Phase	**---**	**---**	**---**			
								Horsepower (HP)	**---**	**---**	**---**			
								Amps	**---**	**---**	**---**			
							Connection Type	**---**						
Plumbing	3/4" pump connection.						**Domestic Water**	Connection (inches)	**---**					
								Flow Rate (GPM)	**---**					
								Capacity (PSI)	**---**					
							Natural Gas	Connection (inches)	**---**					
								Capacity (BTU)	**---**					
							Drain	Floor Drain (Y/N)	**N**					
							Compressed Air	Connection (inches)	**---**					
								Volume (CFM)	**---**					
								Capacity (PSI)	**---**					

Equipment Description:

Receiver, 25 gallon, portable (UO)

EQ ID Number:

7996

7996 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Receiver, 25 gallon, portable (UO)	**7996**

Manufacturer: Graco, Incorporated. **Model No.:** 238866

8276 Equipment Datasheet

Manufacturer:	**Kaeser Compressor**						**Dimensions**		**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**ASD40ST**						**Equipment**		**69-5/8**		**35-3/8**		**60-1/4**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** 15 **Right** 40		**Front** 50 **Back** 40		**Above** 24 **Below** ---		
DISCIPLINE COORDINATION:														
Architectural	Coordinate size of housekeeping pad with equipment.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**Y**				
Structural	Coordinate size of housekeeping pad with equipment. Weight: 1,747 pounds.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)		**Y**				
Mechanical	Heat rejection: 119,270 BTU/hour; 8240 CFM. No equipment vibration isolation if mounted slab on grade. Refrigerant: R-134A, 1.76 pounds.						**Venting**	Connection (inches)		**---**				
								Volume (CFM)		**---**				
Electrical	Provide fusible disconnect with 70 A fuse. Provide data port.						**Connection Size**	Requirements	**Unit**	---	---			
								Voltage	**460**	**---**	**---**			
								Phase	**3**	**---**	**---**			
								Horsepower (HP)	**40**	**---**	**---**			
								Amps	**47**	**---**	**---**			
							Connection Type	**Provide disconnect**						
Plumbing	Floor sink between compressor and dryer on housekeeping pad to sand-oil interceptor						**Domestic Water**	Connection (inches)		**---**				
								Flow Rate (GPM)		**---**				
								Capacity (PSI)		**---**				
							Natural Gas	Connection (inches)		**---**				
								Capacity (BTU)		**---**				
							Drain	Sink Drain (Y/N)		**Y**				
							Compressed Air	Connection (inches)		**---**				
								Volume (CFM)		**---**				
								Capacity (PSI)		**---**				

Equipment Description:

Compressor, air, screw, rotary, 40 HP, with integral dryer

EQ ID Number:

8276

8276 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Compressor, air, screw, rotary, 40 HP, with integral dryer	**8276**

Manufacturer: Kaeser Compressor **Model No.:** ASD40ST

Technical Specifications

Model	Pressure Range (1) (psig)	Capacity (acfm) (2)	Rated Motor Power (hp)	Sound Level (dB(A)) (3)	Standard Air-cooled (4) Units		Air-Cooled Units with Integral Dryer	
					Dimensions L x W x H (in.)	Weight (lb.) (5)	Dimensions L x W x H (in.)	Weight (lb.) (5)
ASD 25	125	112	25	66		1345		1555
ASD 30	125	132	30	67		1369		1579
	175	110						
ASD 40S	125	162	40	67	57 1/2 x 35 1/2 x 60 1/4	1537	69 5/8 x 35 1/2 x 60 1/4	1747
	175	127						
	217	106						
ASD 40	125	191	40	69		1570		1779
	175	159						
	217	123						

8637 Equipment Datasheet

Manufacturer:		**Manchester Tank**					**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:		**302433**					**Equipment**	**36 dia.**		**---**		**101**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left**	**24**	**Front**	**42**	**Above**	**24**
								Right	**24**	**Back**	**24**	**Below**	**---**

DISCIPLINE COORDINATION:

Architectural	Coordinate size of housekeeping pad with equipment.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**Y**			
Structural	Unit weight: 783 pounds	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**Y**			
Mechanical	---	**Venting**	Connection (inches)	**---**			
			Volume (CFM)	**---**			
Electrical	---	**Connection Size**	Requirements	**---**	**---**	**---**	
			Voltage	**---**	**---**	**---**	
			Phase	**---**	**---**	**---**	
			Horsepower (HP)	**---**	**---**	**---**	
			Amps	**---**	**---**	**---**	
		Connection Type	**---**				
Plumbing	Floor sink adjacent to compressor, dryer, and receiver to oil seperator. 1 inch NPT drain connection.	**Domestic Water**	Connection (inches)	**---**			
			Flow Rate (GPM)	**---**			
			Capacity (PSI)	**---**			
		Natural Gas	Connection (inches)	**---**			
			Capacity (BTU)	**---**			
		Drain	Floor Sink (Y/N)	**Y**			
		Compressed Air	Connection (inches)	**---**			
			Volume (CFM)	**---**			
			Capacity (PSI)	**---**			

Equipment Description:

Receiver, vertical mounted, 400 gallon

EQ ID Number:

8637

8637 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Receiver, vertical mounted, 400 gallon	**8637**

Manufacturer: Manchester Tank **Model No.:** 302433

9315 Equipment Datasheet

Manufacturer:	**Unilube Systems**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**Pit Guard, Pit Cover**						**Equipment**	**38**		**40-1/2**		**2**	
Provided:	Cutsheet	Y	Functional Model	N	Design Details	Y	**Operational Clearance**	**Left** 1/2 **Right** 1/2		**Front** 0 **Back** 0		**Above** 0 **Below** 0	

DISCIPLINE COORDINATION:

Architectural	Coordinate clearances and design with structural.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**		
Structural	Pit guard cover will sit on rails the entire length of pit; Provide support for pit guard; Reference Manufacturer's Equipment Design Details.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**		
Mechanical	---	**Venting**	Connection (inches)	**---**		
			Volume (CFM)	**---**		
Electrical	---	**Connection Size**	Requirements	**---**	**---**	**---**
			Voltage	**---**	**---**	**---**
			Phase	**---**	**---**	**---**
			Horsepower (HP)	**---**	**---**	**---**
			Amps	**---**	**---**	**---**
		Connection Type	**---**			
Plumbing	---	**Domestic Water**	Connection (inches)	**---**		
			Flow Rate (GPM)	**---**		
			Capacity (PSI)	**---**		
		Natural Gas	Connection (inches)	**---**		
			Capacity (BTU)	**---**		
		Drain	Floor Drain (Y/N)	**N**		
		Compressed Air	Connection (inches)	**---**		
			Volume (CFM)	**---**		
			Capacity (PSI)	**---**		

Equipment Description:

Cover, safety, metal

EQ ID Number:

9315

9315 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Cover, safety, metal	**9315**

Manufacturer: Unilube Systems **Model No.:** Pit Guard, Pit Cover

9900 Equipment Datasheet

Manufacturer:	**Genfare**						**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:	**Dualport stationary vault**						**Equipment**	**32**		**36**		**66**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** 24 **Right** 24		**Front** 60 **Back** ---		**Above** --- **Below** ---	
DISCIPLINE COORDINATION:													
Architectural	Coordinate with manufacturer's shop drawings for installation of through wall vault receiver; Coordinate probe and retractor location, if applicable.						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**				
Structural	---						**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**				
Mechanical	---						**Venting**	Connection (inches)	---				
								Volume (CFM)	---				
Electrical	---						**Connection Size**	Requirements	---	---	---		
								Voltage	---	---	---		
								Phase	---	---	---		
								Horsepower (HP)	---	---	---		
								Amps	---	---	---		
							Connection Type	---					
Plumbing	---						**Domestic Water**	Connection (inches)	---				
								Flow Rate (GPM)	---				
								Capacity (PSI)	---				
							Natural Gas	Connection (inches)	---				
								Capacity (BTU)	---				
							Drain	Floor Sink (Y/N)	**N**				
							Compressed Air	Connection (inches)	---				
								Volume (CFM)	---				
								Capacity (PSI)	---				

Equipment Description:

Vault, collection, revenue

EQ ID Number:

9900

9900 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Vault, collection, revenue	**9900**

Manufacturer: Genfare **Model No.:** Dualport stationary vault

9910 Equipment Datasheet

Manufacturer:		**Genfare**					**Dimensions**	**Length** (inches)		**Width** (inches)		**Height** (inches)	
Model No.:		**Garage Data System with accessories**					**Equipment**	**---**		**---**		**---**	
Provided:	Cutsheet	Y	Functional Model	Y	Design Details	N	**Operational Clearance**	**Left** --- **Right** ---		**Front** --- **Back** ---		**Above** --- **Below** ---	

DISCIPLINE COORDINATION:

Architectural	Coordinate location of data probe installation.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**		
Structural	Coordinate location of data probe installation.	**Housekeeping Pad**	Mounted 6 inch high, steel reinforced (Y/N)	**N**		
Mechanical	---	**Venting**	Connection (inches)	**---**		
			Volume (CFM)	**---**		
Electrical	Provide one inch conduit from probe to electrical room; Provide one inch conduit for data/control wire from system computer to j-box (up to 1,000 feet).	**Connection Size**	Requirements	**Unit**	---	---
			Voltage	**120**	---	---
			Phase	**1**	---	---
			Horsepower (HP)	**---**	---	---
			Amps	**20**	---	---
		Connection Type	**Provide j-box**			
Plumbing	---	**Domestic Water**	Connection (inches)	**---**		
			Flow Rate (GPM)	**---**		
			Capacity (PSI)	**---**		
		Natural Gas	Connection (inches)	**---**		
			Capacity (BTU)	**---**		
		Drain	Floor Drain (Y/N)	**N**		
		Compressed Air	Connection (inches)	**---**		
			Volume (CFM)	**---**		
			Capacity (PSI)	**---**		

Equipment Description:

Probe, farebox, with software system

EQ ID Number:

9910

9910 Equipment Cutsheet

Equipment Description:	EQ ID Number:
Probe, farebox, with software system	**9910**

Manufacturer: Genfare **Model No.:** Garage Data System with accessories

APPENDIX B: SFMTA OCS DESIGN CRITERIA

GENERAL NOTES

- OCS is only located in the parking areas and certain maintenance bays, as noted.
- Relevant requirements fall in the 2018 criteria (pp 1-5). The remaining information are reference materials that may inform some design decisions.
- LMD shall design a site specific solution, with deviations from the tension requirements outlined in this appendix permitted upon approval by the SFMTA.
- LMD shall take particular note to design an OCS solution for the trolley fleet that anticipates a smooth transition to future battery electric bus.

I. GENERAL

These criteria govern the Overhead Contact System (OCS) design, to provide a safe, reliable and efficient system to deliver electrical power to support and Electric Trolleybuses (ETBs).

A. References

The latest edition of the applicable standards, codes, and guidelines of the following organizations shall be used for all designs unless otherwise required by this section:

- California Public Utilities Commission (CPUC) General Order No. 95, Rules for Overhead Line Construction
- California Public Utilities Commission (CPUC) General Order No. 128, Rules for Construction of Underground Electric Supply and Communications Systems.
- Muni High Performance Trolley Coach Overhead Wire Minimum Standards
- Design standards and criteria developed on previous Muni projects
- American with Disabilities Act (ADA), 49 CFR parts 27, 37 and 38
- American National Standards Institute (ANSI) C2, National Electric Safety Code
- American Public Transit Association (APTA) – Rapid Transit Standards
- California Code of Regulation (CCR), Title 8, Industrial Relation
- California Code of Regulation (CCR), Title 23, Waters
- California Code of Regulation (CCR), Title 24, Building Standards Code
- California Occupational Safety and Health Association (Cal OSHA)
- City of San Francisco Standard Plans and Specifications
- Code of Federal Regulations, Title 29, Part 1910, Occupational Safety and Health Standards
- Code of Federal Regulations, Title 41, Public Contracts and Property Management
- Code of Federal Regulations, Title 49, Part 212, State Safety Participation Regulations

- Illuminating Engineering Society (IES) Model Lighting Ordinance (MLO)
- Insulated Cable Engineers Association (ICEA)
- National Electric Code (NEC)
- National Electrical Manufacturers Association (NEMA)
- National Fire Protection Association (NFPA) Standard 130, Fixed Guideway Transit and Passenger Rail Systems
- Occupational Safety and Health Act of 1970 (OSHA)
- San Francisco County Ordinance Code
- San Francisco Municipal Code
- Telecommunications Industry Association (TIA)
- Underwriters Laboratories (UL)
- Uniform Building Code (UBC)
- Uniform Fire Code (UFC)
- Uniform Plumbing Code (UPC)

Where more than one code, standard, or criterion is applicable, the most restrictive shall govern, except as indicated in this document. The Safety Criteria shall be reviewed in light of new editions and issues of these codes and standards at the beginning of each design phase and shall be amended as appropriate. All materials, equipment, design, manufacturing methods, installation, and testing shall conform to all applicable Federal, State, and local codes and regulations. In addition, Muni standards and established Industry Standards and practices shall govern the design and construction.

II. DESIGN CRITERIA

This section provides the general OCS design criteria. Project specific design criteria addressing the project needs should also be incorporated.

A. Electric Trolley Buses (ETBs)

Overhead hardware used should be products of manufacturers regularly engaged in the production of such material and equipment, and is of the manufacturer's latest design

approved by Muni. This is to ensure compatibility and interchangeability with the current Muni overhead hardware and spare parts. The followings are specific hardware characteristics for the project:

1. Hardware Criteria

   i. Overhead Contact System Type - OCS shall be a rigid type system similar to Ohio Brass (OB)/Westinghouse Air Brake Company (WASCO)/Impulse NC, Inc Contact System or a flexible system similar to Kummler & Matter System.

   ii. Contact Wire- Contact wire shall be bronze, grooved, alloy 80 conforming to ASTM B9-90. The following characteristics shall be used:

Table II.B.1 Trolley System Contact Wire Standards

Description	Min. Standards
Contact Wire for Trolley Vehicles	#4/0 or #2/0
#4/0 Contact Wire Tension @ 60°F	3000 lb per wire
#2/0 Contact Wire Tension @ 60°F	2000 lb per wire
Contact Wire Height	19ft-6in ± 3in
Contact Wire Spacing	2ft
Axis of Trolley wire pair from curb unless otherwise noted	14ft
Maximum Unsupported Contact Wire Span	100ft

   iii. Overhead Components and Trolley Wire Replacement – Replace overhead components and trolley wires that have a service life of less than 50%.

   iv. Leading Switch -15° Induction Controlled

2. Trolley Wire Alignment shall be in accordance with guidelines and criteria established by Municipal Railway High Performance Trolley Coach Overhead Minimum Standards.

C. Overhead Supports and Foundations

1. OCS Poles

   Steel poles shall be in accordance with Muni Standard Drawing CL-7971, Rev. 2. Standard pole Types 761N, 765N, 767 and 770 should be used.

   New poles should be in line with property line between adjacent properties and avoid fronting doors, windows, and access ways wherever possible. They should be

located within the first flag from the curb (18in to near side face and 24in to center of pole approximately). New poles should be 3ft from low-pressure hydrant and 5ft from high-pressure hydrant from centerline of pole to centerline of hydrant. New poles should be located away from new and existing ADA curb ramps, trees, sub-sidewalk basements, etc.

Where an existing pole is replaced with a new pole, the new pole should be 4ft away (minimum) from the present location. At intersections adjoining side platforms the poles should be as clear of the corner as possible to avoid being hit by right turning trucks. Other overhead utilities might share pole and air space such as PG&E, PAC Bell, TCI and/or Viacom.

Wherever possible, poles should be combined with streetlight and traffic signals to reduce the number of poles. Combination poles should be located within 3ft of perpendicular property line.

Poles with feeder risers inside should not be combined with traffic signals.

2. Poles Foundations

Unless otherwise noted, existing foundations should be removed to a depth of 3ft below the finished grade. Where a pole has to be replaced in place due to space constraint, the existing foundation should be removed entirely and new foundation installed in place.

New standard pole foundations shall be in accordance with Muni Standard Drawing CL-7971, Rev. 2. Where special foundations are required, they shall be designed according to the current codes, regulations and field conditions.

3. Pole Replacement

Replace City-owned wood, segmented, concrete, and/or steel poles that are bending, leaning, deeply pitted, undersized, with exposed rebars, rusted and/or with holes along the shaft or base.

4. Protection Devices

Wood troughs, preformed glass/epoxy shields, or approved apparatus of a custom design if necessary, should be used wherever the overhead support structure shall be protected against possible arcing conditions and in accordance to the GO 95, Rules for Overhead Lines Construction.

Guy wire span supports shall include tree guard or similar item to protect against trolley shoe snags during dewirement from a trolley vehicle.

5. Finish Treatment

   Unless otherwise required by urban design requirements or streetscape master plan, new steel pole shall have a galvanized finish (Not Painted). Existing steel trolley pole shall be painted to match galvanizing or existing coating color. Anti-graffiti coating shall be applied to the bottom 8 ft of the pole.

6. All new OCS poles shall be grounded.

Appendices

1. Transmission of Trolley Coach Overhead Wire Guidelines, dated 4/6/89
2. New Muni Overhead Trough Suspension Instructions, 8/4/94

Appendix 1

SAN FRANCISCO MUNICIPAL RAILWAY 949 PRESIDIO AVENUE, SAN FRANCISCO, CALIF. 94115 415-673-6864

FINAL

TO: Don Keener

FROM: W. G. Stead

DATE: April 6, 1989

RE: TRANSMISSION OF TROLLEY COACH OVERHEAD WIRE GUIDELINES

Enclosed is a copy of the Municipal Railway High Performance Trolley Coach Overhead Standards. These standards represent MUNI policy on those issues relative to the design of our Trolley Coach Overhead System, and should be followed by UEB designers on MUNI trolley overhead projects. If UEB believes that these standards cannot be applied to a particular circumstance, which will happen, the MUNI project coordinator should be contacted to review the circumstances.

Our staff is prepared to work with your Project Managers and Designers in implementing these guidelines. In particular, we will be providing UEB with explanatory drawings of key concepts contained in the guidelines.

These guidelines should eliminate the need for ad hoc communication between MUNI personnel and UEB designers during the design phase of these projects, and all communication will go through the UEB Project Manager to/from the MUNI Project Coordinator.

cc: J. Ivester
E. Pearson
B. Bernhard
J. Katz
M. Cohn, UEB

Enc.

OVHDGDLN

SAN FRANCISCO MUNICIPAL RAILWAY 949 PRESIDIO AVENUE, SAN FRANCISCO, CALIF. 94115 415-673-6864

TO: W. G. Stead

THRU: J. Ivester
B. Bernhard

FROM: John Katz

DATE: April 6, 1989

RE: TROLLEY COACH OVERHEAD DESIGN STANDARDS/SIGN-OFF

Enclosed is the final draft of the Trolley Coach Overhead Design Standards. These standards were drafted by Carl Natvig of the Service Planning Department, and revised by the Trolley Coach Overhead Committee. The members of the committee are Art Curtis (Deputy Superintendent Surface Transportation), Harold Conklin (Manager, Hetch Hetchy Overhead Lines Department), Peter Straus (Director of Service Planning), and Galen Sarno (Chief Electrical Engineer, MRED). All have approved this final draft for use by UEB designers when designing new or reconstructed trolley overhead projects.

These standards incorporate the decision you made, based on the recommendation of Ed Pearson, that Ohio Brass-type suspension should be employed on all tangent wire at this time.

We recommend that you approve these guidelines by signing the enclosed transmission memo to UEB.

We also want to thank Bobbie Chapman for doing such a super job of typing the many drafts of this document in both a professional and pleasant manner.

Enc.

DESGNSTD

MUNICIPAL RAILWAY
HIGH PERFORMANCE TROLLEY COACH OVERHEAD WIRE
MINIMUM STANDARDS

note: @ all cases, use template which has a better visual view of what is really happen.

I. SWITCHES

A. Scheduled Service or Pull-in Pull-out Switches

1. Mechanical Crossing.
-(10 degree switch is awaiting test results)-

   a. Leading Switches. A 10 or 15-degree mechanical crossing with stainless steel or similarly moveable runners shall be used for all regularly used leading switches.

   b. Trailing Switches. A 10 or 15-degree mechanical crossing with stainless steel or similarly durable moveable runners shall be used for all regularly used trailing switches.

   c. Preferred Direction. The runners shall be set to favor the more heavily used direction where use is 50% less and speeds below 15 mph in the less used direction.

2. Inductive Control. Inductive control shall be provided for all advance 15-degree switches. (and 10°)

3. Single-coil. A single-coil with mechanical reset shall be employed with inductive control switches.

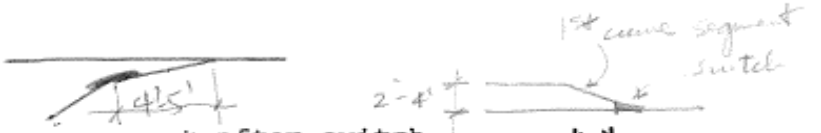
4. Advance Switch Spacings. All regularly used leading switches shall be located in advance of the intersection as follows:

   a. Leading switch to intersection nearside stop line

      (1) Left or right-hand - one or two lanes in each direction .....90-110 feet (one span)

      (2) Left-turn - three or more lanes in direction of travel .....300-400 feet (three or four spans)

      (3) Left-turn - unique condition (auto queues, etc.) .....as specified by MUNI



b. First curve segment after switch

First curve segment to advance switch
.....4-5 feet
(From the trailing tip of the switch crossing plate or insulated runner assembly to the leading tip of the curve segment.)
(To minimize forward acceleration on poles.)

c. Inductive antenna to leading switch
.....40 feet

d. Inductive antenna to indicator light
.....170 to 240 feet
(i.e. second span from switch or as specified by MUNI)

5. Indicator Lights. Indicator lights (see reference drawing) shall have the following characteristics:

a. 8 inch lenses.

b. Masked for 1-1/2 by 6 inches.

c. Double filament lamps if available.

d. Straight indication on top, diagonal turn indication below.

e. Pole-mounted wherever possible. Guy mounts may be used where there are visual obstructions or when requested by MUNI.

f. 8 inch hood.

g. Lamp voltage and series resistance designed for minimum 2-year life.

h. A micro-switch as specified by MUNI shall be used for the light switch.

6. Control Wiring.

a. Control wiring shall be suspended from a separate messenger wire of 3/16 inch diameter at least 2 feet above the contact wire level.

b. Control wire cable shall be multi-conductor, color coded, single jacket.

7. Y-Switches. A 10 or 15-degree Y-switch shall be used where the dominant direction of travel is in the turning direction.

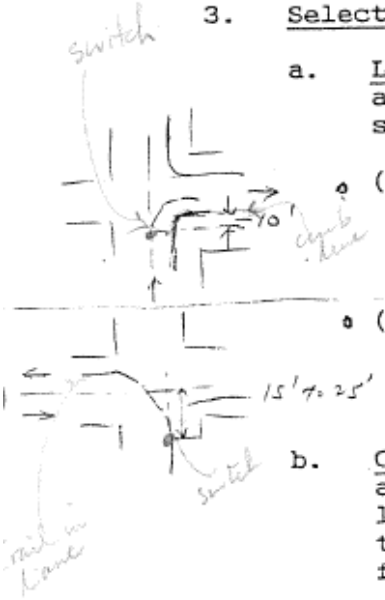
(NON REVENUE ROUTE)

B. Emergency Switches

1. 30-Degree Switches. Selectric 30-degree switches shall be employed for all right turns and for all left turns with the exception of left turns where there is more than one lane in the direction of travel. (No 23-degree switches shall be used.)

2. Advance Switches. Advance, left-hand, inductive 10 or 15-degree switches shall be employed for left turns on streets with more than one lane on the lead-in street.

3. Selectric Switch and Curve Segment Location.



a. Leading Selectric Switch. The following standards are intended to prevent the false activation of selectric switches:

(1) Right-turns. The leading switch frogs shall be located approximately 10 feet before the curb line of the trail-in street for right turns.

(2) Left-turns. The leading switch frogs shall be located approximately 15 to 25 feet before the traffic dividing line of the trail-in street for left turns.

b. Curve Segment. The first curve segment shall have a spacing of 0-5 feet from the trailing tip of the leading selectric switch to the leading tip of the curve segment for right turns and 0-10 feet for left turns.

c. Trailing Switch. The trailing switch shall be located over the center-rear of turning coaches wherever possible.

d. Selectric Switch Alignment. Selectric switch layouts need not be aligned over the inside rear corner of turning coaches.

8. Combination Curve-Crossings. No combination curve-crossings shall be used unless specifically approved by MUNI. Additional curve segments shall be used to avoid use of combination curve-crossings.

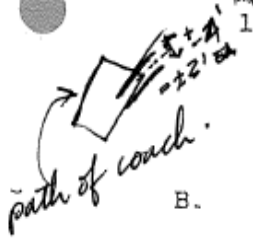
9. Tangent Clamps. A maximum of 1.25 degrees per foot of curve runner or per HS-type clamp shall be used.

10. Curve Alignment. All curve segments shall be located over the inside rear corner of the turning coach as determined by field tests. The location of coach stops should be considered in determining the typical path of a turning coach.

a. Right Turns. The contact wire axis shall be 2-3 feet from the curb at the apex of right turns; and the first and last curve segments shall be 8 to 11 feet from the curb unless specified otherwise by MUNI.

b. Left Turns. As a general rule, the left turn wire should pass over the two intersecting points of the stop lines and the traffic dividing lines in the path of the turning coach (on two-way, one lane per direction streets).

11. Guying in Turns. Curve segments shall be located in such manner axially and laterally within plus or minus ± 2 feet of the path of the inner rear corner of the turning coach to minimize the amount of guying required to support the curve segments.



B. Emergency Routes

1. Curvature. A maximum of 30 degrees per curve segment shall be used.

2. Long Radius Turns. For turns with a radius of 50 feet or greater, additional curve segments shall be used as needed.

3. Combination Curve-Crossings. No combination curve-crossings shall be used unless specifically approved by MUNI. Additional curve segments shall be used to avoid use of combination curve-crossings.

4. Curve Alignment. (The same as for regularly used turns with the exception of selectric switch turn lay-outs.)

III. SECTION INSULATORS
(No. Bos, Breakers, Insulated Runners)

A. Far-Side Crossings. Insulated runners shall be in the far-side crossing for each direction of coach travel at intersections.

B. Section Insulators. Insulated runners between circuits shall be located in non-accelerating locations if a far-side crossing is not available.

C. Switches. Insulated runners in switches shall be in the turn-out direction in leading and trailing switches.

D. Exceptions. Exceptions to the location of insulated runners shall be employed only when specified by MUNI. Possible exceptions may be as follows:

1. Some crossings in left-turns.

2. Some crossing locations with steep up-hill grades on narrow streets with heavy traffic.

3. Some switches where the turning direction is the dominant direction of travel.

4. Emergency routes will generally have all the insulated runners when crossing revenue routes.

E. Magnetic Blowout. Magnetic blowouts of a type approved by MUNI (a permanent magnet type is now used) shall be used on the first insulated runner of switches, crossings, and section insulators.

IV. TANGENT WIRE

A. Tangent Wire Suspension. OB type or equivalent suspension system will be used on all tangent runs.

B. Concave and Convex Vertical Curves. All vertical curves shall be designed for 25 mph or the typical speed of traffic, whichever is greater, with a maximum of 1.25 degrees of curvature per foot of runner. (A lower design speed may be used where coaches turn sharply at the vertical curve.) Vertically curved K & M clamp-type curve runners (with rigid suspension), K & M copper tubing with passage clamps, or equivalent clamp-type runner shall be used.

C. Single-Track. Bracket arms or davit poles with flexible suspension shall be used for single-track runs except: concave vertical curves; where distances between the curb and wire locations are more than 18 feet; or where trolley poles are already in place.

D. Tangent Wire Axis. The following wire axis to curb distances shall be used:

1. One or two lanes per direction.

   a. For streets narrower than 48 feet:
      -14 feet OR center of traffic lane - whichever is greater.
      Center of trolley wires to curb line

   b. For streets wider than 48 feet:
      -16 feet OR center of traffic lane - whichever is greater.

2. Three lanes per direction.
   .....center of traffic lane plus 3 feet
   -18 feet maximum

3. Three lanes per direction with loading bulbs
   -20 feet
   (only where all stops have bulbs)

* Bridges - 45° - 18' clearance | according to DPT/DPW? criteria?
60° - 19' clearance.

VII. INTERSECTIONS

A. Network Guys. A maximum of three guys shall be attached to bull rings on the high tension side of curve segment support networks. A greater effort to network and reduce guys should be employed in residential areas than in industrial areas.

B. Brail Wires. Brail wires shall be used primarily on the inside of turn layouts and be located a minimum of 3 feet from parallel contact wires.

C. Constant-Carbon-Contact. Constant-carbon-contact for all crossing plates and switches shall be used. Fabricated OB deep-runner crossing plates shall not be used.

D. Design Life. Adequate minimum runner depth in flangeways of crossing plates and switch plates shall be employed to allow for a clearance of 1-3/8 inches after 2 million carbon trolley shoe passages (with a pressure of 28 pounds). Flangeways shall be configured to allow easy passage of bent poles.

E. Pole Location. Generally, trolley support poles should be located to minimize the total length of guy wires. Generally, no more than 2 poles per corner should be used. Generally, advance switches should be located one span from the adjacent intersection, the main tension guy (head guy) attached to the switch should be attached to a pole or poles one span from the switch.

F. Eyebolts. Eyebolts shall be employed wherever practical to install and if buildings of suitable strength are available. (City policy requires that all new buildings of adequate strength along existing or proposed trolley coach routes must provide eyebolts.)

G. Traffic Signal Pre-empts. Traffic signal pre-empts shall be provided at signalized intersections as specified by MUNI (in consultation with other City departments). New signalized intersections shall be provided as specified by MUNI (in consultation with other City departments).

9/18/85
Revised 11/28/86
Revised 5/17/88
Revised 9/15/88
Revised 11/2/88
Revised 3/20/89
Revised 4/5/89

OVHDSTDS

Appendix 2

POWER, SIGNALS & ELECTRONICS, 2502 ALAMEDA ST., SAN FRANCISCO, CA 94103

August 4, 1994

TO : John Katz

FROM : Vic Lamevse VL

SUBJECT : NEW MUNI OVERHEAD TROUGH SUSPENSION INSTRUCTIONS

Attached is the new instruction on our overhead trough suspension. Also included is a drawing detailing the suspension.

If you have any comments, please let me know at 554-9211.

cc: Rav Favetti
Drew Howard
William Wong

PUBLIC UTILITIES COMMISSION CITY AND COUNTY OF SAN FRANCISCO

POWER, SIGNALS & ELECTRONICS, 2502 ALAMEDA ST., SAN FRANCISCO, CA 94103

MUNI OVERHEAD TROUGH SUSPENSION INSTRUCTION

The trough for Muni Overhead suspension should be made of hardwood and it should be waterproof for outside use. But if it has to be installed inside a building or in an enclosure. then the wood need not be necessarily be waterproof. All troughs should be designed in a way that will enable the crew to reach the top above the trough during maintenance so that you can repair insulators that support the overhead in the trough.

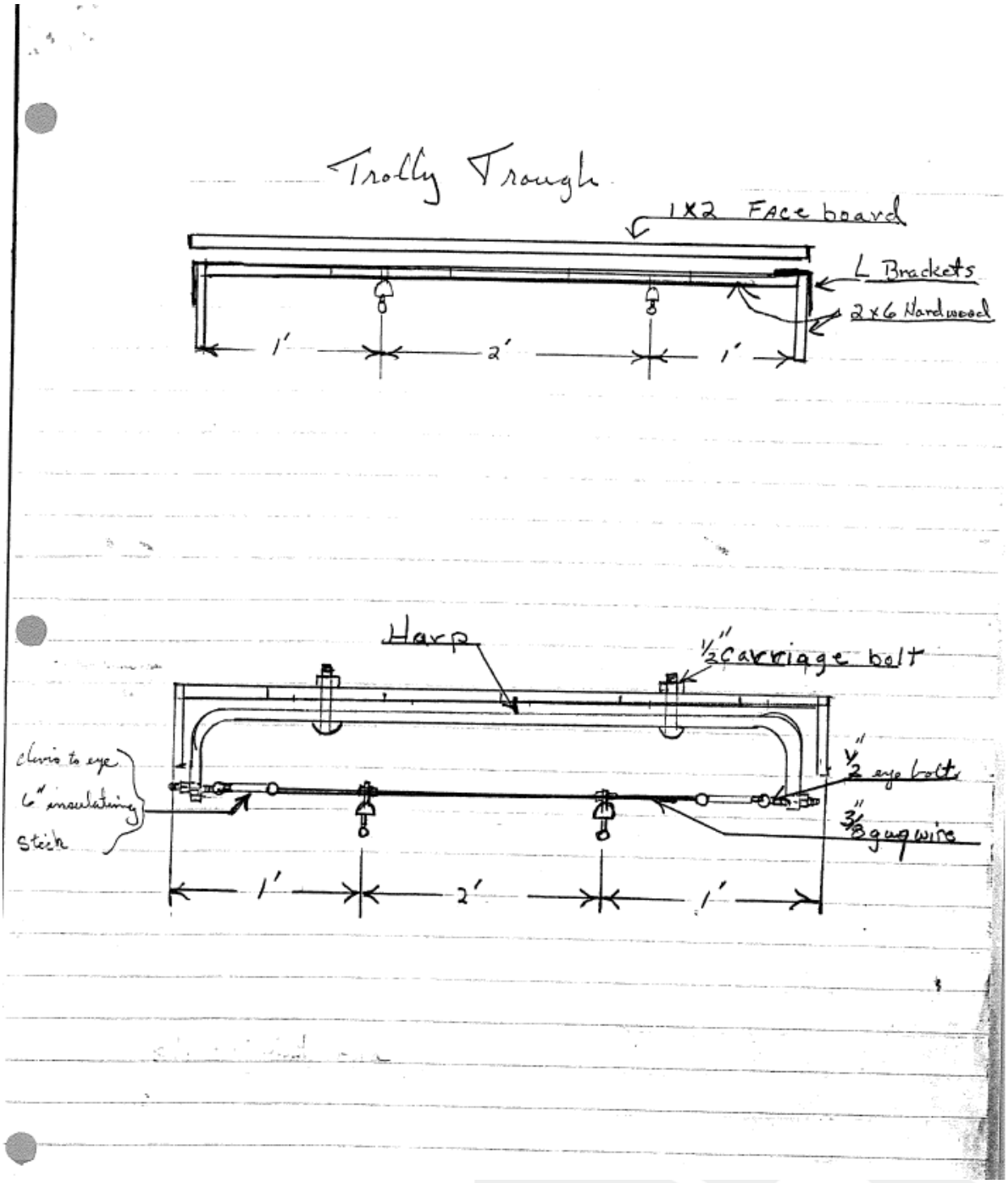
The wood should run parallel with the wire and be made of 2" x 6" as well as the kickboard on the sides. On each side of the outside wire, should have a 1 foot clearance between the wire and kickboard. A 1" x 2" board should be installed on the face of the trough to prevent the wood from splitting from poles hitting it. An "L" bracket should be installed to strengthen the kickboard from pulling apart. The trough should extend 2 feet passed the ends of the structure so we can mount a harp if needed.

Harps should be installed where the nearest tangent support wire is more than 60 feet from either end of the trough. Harps are made of steel channel iron 6" x 1" and have 2 clevis to eye 6" stick, with threaded eye bolt to adjust tension on harp. Harps should be 4 feet long (see attached drawing on Harp).

Splice joints should be made of channel iron 2" x 6" to give support to splices in trough so it would not sag.

Also, lags and wood screws should not be used because they will only pull apart. When putting together splices and attachments always use nuts, bolts, lock washers and flat washers.

USE ½" CARRIAGE BOLT


Trolly Trough
1X2 Face board
L Brackets
2x6 Hardwood
1'
2'
1'
Harp
1/2" carriage bolt
clevis to eye
6" insulating
stick
1/2" eye bolt
3/8 guy wire
1'
2'
1'

WORKING PROPERTIES OF COMMON WOODS

of Wood	General Characteristics							Machining					Remarks
	Weight per Cu. Ft. (1)	Hardness	Strength (2)	Stability (3)	Gluing	Nailing (4)	Steam Bending	Planing and Jointing (5)	Turning (6)	Sanding (7)	Shaping	Mortising (8)	
Ash	35	Med.	Med.	Best	Fair	Good	Good	Good 10-25		Best 2/0			Tough – Hard to work with hand tools.
Basswood	24	Soft	Weak	Good	Best	Best	Poor	Good 20-30	Poor	Poor	Poor	Fair	Excellent for trays, drafting boards,
Beach	39	Hard	Med.	Poor	Poor	Poor	Good	Fair 10-20	Fair	Good 4/0	Fair	Best	Not durable outside. Hard on tools because of mineral deposits.
Birch	40	Hard	Strong	Fair	Fair	Poor	Good	Good 15-20	Good	Fair 4/0	Best	Best	Excellent for furniture, turning, dowels, handles.
Butternut	25	Soft	Weak	Best	Good	Fair	Poor	Good 10-25	Good	Fair 4/0	Fair	Fair	Furniture—Perfect for walnut imitation.
Cherry	36	Med.	Med.	Good	Best	Fair	Poor	Best 10-25	Best	Best 4/0	Best	Best	Furniture, hand trim, novelties.
Chestnut	27	Soft	Weak	Best	Best	Good	Fair	Good 15-20	Best	Best 3/0	Good	Good	Stains badly in contact with wet iron Very dusty in all machining opers.
Cottonwood	27	Soft	Weak	Fair	Best	Best	Poor	Poor 5-20	Poor	Poor 4/0	Poor	Fair	Excellent for boxes & other nailing jobs—wears very well for soft wood.
Cypress	29	Soft	Med.	Good	Fair	Fair	Poor	Good 15-25	Poor	Fair 2/0	Poor	Poor	Tends to splinter. Most durable of Amer. woods for outdoor & soil expos
Elm (Southern)	34	Med.	Med.	Poor	Fair	Best	Good	Poor 15-20	Poor	Good 2/0	Poor	Good	Very durable under paint. A good furn. wood despite diff. in machining
Gum (Red)	33	Med.	Med.	Poor	Best	Good	Fair	Fair 10-20	Best	Fair 4/0	Fair	Fair	One of the most used furn. woods for imitations of walnut & mahogany.
Hickory	42	Hard	Strong	Good	Good	Poor	Good	Good 10-25	Good	Best 2/0	Fair	Best	Excellent for furniture & steam bending, tool handles, wheels.
[illegible]lia	30	Soft	Weak	Fair	Best	Best	Best	Good 5-15	Fair	Good 4/0	Good	Poor	Excellent for steam bending. Often marketed as poplar.
Mahogany	35	Med.	Med.	Best	Best	Good	Poor	Good 5-25	Best	Good 4/0	Best	Best	One of the best furniture woods
Mahogany (Phil.)	33	Med.	Med.	Best	Best	Good	Poor	Good 5-25	Good	Poor 3/0	Fair	Fair	Generally coarser & softer than true mahogany. Furn., boat planking, trim
(9) Maple (Hard)	41	Hard	Strong	Good	Fair	Poor	Fair	Fair 15-20	Good	Good 4/0	Best	Best	Fine furn., flooring, turnings, bowling pins. One of the best hardwoods.
Maple (Soft)	31	Med.	Med.	Fair	Good	Fair	Fair	Poor 10-15	Fair	Good 4/0	Fair	Poor	Some uses as hard maple but an inferior wood. Difficult to mach. smth.
Oak (Red)	39	Hard	Strong	Best	Good	Good	Best	Best 10-25	Good	Best 2/0	Fair	Best	Substitute for white oak in cheaper work.
Oak (White)	40	Hard	Strong	Best	Good	Good	Best	Best 10-20	Good	Best 2/0	Good	Best	Interior trim, floors, furniture. One of the most used American woods.
Pine (White)	25	Soft	Weak	Good	Best	Best	Poor	Good 10-25	Good	Fair 2/0	Good	Fair	Best all around soft wood. Excellent for paint.
Pine (Yellow)	38	Hard	Strong	Fair	Fair	Poor	Poor	Good 10-25	Poor	Fair 2/0	Good	Good	Main uses—house construction, trim, floors.
Poplar	29	Soft	Weak	Good	Best	Best	Fair	Good 5-20	Good	Poor 4/0	Poor	Fair	Excellent for carvings, toys, corestock.
Redwood	29	Soft	Med.	Best	Best	Good	Poor	Good 10-25	Fair	Poor 2/0	Good	Poor	Excellent for outdoor furniture, window sills, etc.
Sycamore	35	Med.	Med.	Poor	Good	Best	Poor	Poor 5-15	Good	Poor 3/0	Poor	Best	Interior trim, furniture. Difficult to mach. but excellent appearance.
Walnut	36	Med.	Strong	Best	Best	Fair	Good	Good 15-20	Best	Best 4/0	Good	Best	Has every good feature for furniture and cabinet work.

NOTES: Data in this chart is largely from extensive tests made by U.S. Forest Products Laboratory, with some additions.

1. Pounds per cubic foot, dry. All woods vary in weight, even in the same tree from trunk to top. A variation of 10% over or under average should be allowed.
2. Composite strength value. Woods rated weak are strong enough for all average work.
3. Rated on unrestrained warp. Most woods are quite stable if properly seasoned and cared for.
4. Based on ability to take nails near end without splitting.
5. On flat grain stock, shallow cut. Rating is average from runs at 15, 20 and 25-degree cutting angles. Bottom figure is best knife angle for smooth cutting.
6. Rated on smooth cutting and ability to hold detail. Not much difference between best and good.
7. Rated on freedom from fuzz. Bottom figure is
8. Rated on smoothness of cut. Work speed decreases with hardness of wood and this factor might be of more importance than smoothness in production work.
9. Sugar, white or hard maple. Should be distinguished from silver, red, big-leaf or soft maple, which is an inferior machining wood although often marketed simply as "maple."

Please file with your Trolley overhead Standards

SAN FRANCISCO MUNICIPAL RAILWAY 949 PRESIDIO AVENUE, SAN FRANCISCO, CALIF. 94115 415-673-6864

TO: DICK BRANDT

FROM: JOHNNY B. STEIN Johnny B Stein

DATE: JANUARY 31, 1994

RE: AMENDMENTS TO TROLLEY OVERHEAD DESIGN STANDARDS

The enclosed document is a set of amendments to the High Performance Trolley Overhead Standards originally transmitted to you in 1989. While the original standards have been extremely helpful in designing improved and consistent overhead projects, they were incomplete in some areas and need revisions in others.

Therefore the purpose of the enclosed amendments is to set standards in areas that were not covered by the original guidelines (tensionning and support), or to make changes in other areas (guy wire, control wiring).

Since these standards were worked out in meetings between our overhead committee and your overhead design staff they should be easy to understand and implement. In fact some of these concepts are being incorporated on a project by project basis but have not yet been codified as a set of amendments to the standards.

Please call John Katz if you have any questions about the content of these standards. Thank you.

cc: Phil Chin
Phil Adams
Kathy Gilbert
John Katz
Hoy Wong
Vic Lameyse
Peter Straus
Art Curtis
Carl Natvig

VIII. TENSIONNING AND SUPPORT

A. Head Guy. Only the head guy wire should be held with great tension.

B. Side Guys.

1. All side guys should be attached lightly to special work, usually about 200-300 lbs. tension.

2. All side guy wires should be hung from the highest point on the pole so they will not interfere with other guy wires or contact wire.

C. Tangent Span Tension.

1. Tangent spans are installed to support the trolley wire weight only, except where there are significant grade slopes.

2. In most cases tension on tangent spans should be not more than 500 lbs.

D. Curve Segment Guy Strands. Where possible each curve segment guy strand should be supported independently of the other curve segments. Multiple guying to several segments in the opposing corner and/or special work should be avoided. The exception to this is where parallel turns can be supported by one guy wire.

E. Final Contractor Adjustment. After initial installation but prior to final acceptance of the job the contractor should adjust pole band heights of guy wire in order to avoid guy wire interference coming within one foot of contact wire. This can be done by having the contractor leave a 2' tail on the end of the guy wire at the pole. The remaining tail should be cut off at the completion of the final adjustment.

IX. GUY WIRE SIZE AND TYPE

A. Type. Use 3/8" utilities guy wire rated at least utilities grade 4. Do not use fiber guys. (replaces section VI-E)

B. Securing Guy Wire. Preforms and dead end automatic will be used to secure guy wire. Do not use crimp on sleeves for dead ending.

C. Do Not Use Thimbles. Thimbles for securing guy wire are not used and should be eliminated from all future material lists.

trolle can do by spec.

X. CONTROL CABLE AND WIRING
(Replaces existing section 1-A-6.)

A. Type. Multiple Control Cable should be seven (7), #14 wire single jacket with messenger.

B. Messenger Wire. Messenger wire should be 1/4 inch diameter, suspended at least 2 feet above contact wire.

C. Color Code. Muni will provide the color coding for control wiring for switches and multiple control cable. The contractor should not proceed with installation unless the wire colors are consistent with Muni color coding.

D. All control wire should be installed with fuse protection.

OVHDGID2

February 22, 1994

MEMORANDUM

TO: Johnny B. Stein

FROM: Richard E. Brandt

SUBJECT: **Trolley Overhead Design Standards**

Thank you for your update of the Trolley Overhead Design Standards of January 31, 1994.

This update formalizes the current design practice being used as agreed by the Overhead Committee.

It should be remembered that these are general guidelines which sometimes have to be varied to meet site specific conditions.

For example, MUNI has advised as that esthetics and minimizing the impact on views are important considerations in the design of the overhead along the Embarcadero. If we were to follow VIII D literally and not use multiple guying, the additional poles and individual guy wires would block views and result in an unesthetic design.

bcc: M File
W. Neilson
W. Wong
Overhead Section

ja:STANDRDS.WN

1155 MARKET STREET, SAN FRANCISCO, CA 94103 • (415) 554-0700

SECTION

OVERHEAD WIRE SYSTEM

1. GENERAL:

The overhead trolley wires will provide electrical power to streetcars at 615 VDC. The PCC and other historic streetcars will be equipped with trolley poles to take power from overhead trolley wires. Contact wire will be installed over each track by means of carbon wipers.

Current will be returned through the rails in the street.

2. DESIGN CRITERIA:

a. CONTACT WIRE:

The contact wire will be supported by span wires. The following charateristics will be used:

Material	Alloy 80 Bronze
Type	Round, grooved ASTM B9-47
Size	# 4/0 AWG
Height	18'-6" to 19'-0"
Supports	~~110 ft~~ 100 ft
Design Voltage	615 VDC
Design Tension	3,000 lbs

b. SPECIAL TRACKWORK & CURVE CONSTRUCTION;

At rail line crossovers and turnouts, the overhead system will be designed to maintain contact between the wire and the PCC trolley shoe.

Overhead system construction at the curves will require the ~~contract~~ contact wire to be offset ~~(pulled off)~~ to maintain continuity of contact between the cars and the contact wire. Each curve radius will require evaluation of the following parameters to determine the pull off spacing. Pull-off will be spaced per drawing K-41 "Location of Contact Wire Above Track For Pole And Pantograph Operation"

a) minimum curve radius
b) radius of spiral curve entering
c) radius of spiral curve leaving
d) curve super elevation

c. SWITCHES:

Leading and trailing switches shall be 15° mechanical crossings with stainless steel or similarly durable moveable runners used for all regularly used switches.

d. TURNS:

Curvature: Curve segment shall not exceed 3.125° per foot of runner on 90° turns.

V1-20

e. Poles: Number of poles will be minimized by combining trolley, streetlight and traffic signal poles where feasible. Poles will be ATEA 700 series.

DESIGN CODES AND GUIDELINES:

Design codes and guidelines applicable to this project are as follows:

Trolley Overhead

Muni High Performance Trolley Coach Overhead Wire Minimum Standards. Revised 03/20/89.

General Order No. 95 of the Public Utilities Commission of the State of California, March 1981.

Design standards and criteria developed on previous trolley overhead projects.

Safety - Cal/OSHA

Pole - American Transit Engineering Association (ATEA, Section D15-57). Revised and approved as standard 1957.

Foundation and Concrete

City and County of San Francisco DPW Standard Specification (Section 800.11), July 1986.

American Concrete Institute (ACI 318-83) November 1983.

Others (Latest Edition)

Public Works Code Electrical Code, Traffic Code and other applicable ordinances of the City and County of San Francisco. July 1986

American National Standards Institute (ANSI)

American Society for Testing and Materials (ASTM)

Electric Industries Association (EIA)

Insulated Cable Engineers Association (ICEA)

Institute of Electrical and Electronic Engineers (IEEE)

National Electrical Manufacturers Association (NEMA)

Regulations for Working in San Francisco Streets, Department of Public Works, City and County of San Francisco. July 1986

Underwriter Laboratories, Inc. (UL)

General Order 128 of the Public Utlities Commission of the State of California.

APPENDIX C:
SFPUC APPLICATION FOR ELECTRICAL SERVICE

Potrero Yard Modernization Project

2500 Mariposa Street

SF Public Utilities Commission (PUC)

Wholesale Distribution Tariff (WDT) Application for Power Service

Enclosed Application Materials:

1. FEEDER 1 APPLICATION (INDUSTRIAL LOAD)

This application covers the bus facility load and a portion of the battery electric bus charging load. NFPA70 Article 625 Sec42 states automatic load management system can be used for feeder rating. Based on modeling, estimated peak load with load management is 9,941kW. Designs include automatic load management and intelligent switchgear that can function as a backup to the load management limiting peak demand to 9,941kW. Second service requested for remainder of chargers & site load.

The total peak BEB charging load is ~12.7MW, split between two feeders. Feeder 1 is all BEB and anticipated to peak around 9.9 MW. Feeder 2 is mixed between BEB charging, residential, bus operations, and commercial uses. This totals 3MW peak for residential, 5MW for commercial/bus yard ops, and 2.8 MW for BEB charging. The connected load is higher than the peak load for BEBs because automatic load management systems should be used per NEC code Article 625 section 42.

APPLICATION FOR ELECTRIC SERVICE

Refer to the Application Checklist to complete this form. Submit separate forms for temporary construction power and permanent power.

Project Information

Project Name
Potrero Yard Modernization Project

Address *
2500 Mariposa St, SF, CA 94110

Nearest cross street
Bryant Street

City *
San Francisco

Supervisorial District
10

Project Type
New Service

Load Type *
- ○ Residential
- ○ Light Commercial
- ○ Commercial (industrial secondary)
- ◉ Industrial (industrial primary)
- ○ Mixed Use
- ○ Other

Service Type
- ◉ Underground
- ○ Overhead

Service Duration *
- ◉ Permanent
- ○ Temporary

Will property be all electric? *
- ◉ Yes
- ○ No

Buy America Requirements/Federal Funding Restrictions?
- ○ Yes
- ◉ No

Date Electrical Service Requested
06/01/2023

Construction Start Date

Anticipated Contractor Bid Date

Number of Buildings
1

Number of Stories
13

Total Building Area
1300000

Existing Meter No.

Meter Room No. and Location

Number of Independent Electric Services

Number of Residential Units

Avg. Sq. Foot per Residential Unit
702

	Hours /Day	Days/Week	Months/Year	Business Hours
Summer Operating Hours	24	7	12	0:00 to 24:00

	Hours /Day	Days/Week	Months/Year	Business Hours
Winter Operating Hours	24	7	12	0:00 to 24:00

Description *

Brief description of the project and electric load type below. Please include the supply details, such as "irrigation pump" or "temporary construction power for new affordable housing development."

The Potrero Yard Modernization Project will demolish existing uses and construct a new 3-level bus maintenance and storage facility, equipped with battery electric bus infrastructure, up to 575 housing units, and ground floor retail as an integrated mixed-use development

Contact Information

Application submitted by

- (●) Owner/developer
- ( ) Electrical engineer
- ( ) Electrical contractor
- ( ) General contractor
- ( ) Architect
- ( ) Other

Applicant Information

Company/Agency Name

San Francisco Public Works

Contact Name & Title *

Rachel Alonso, Project Manager

Invoice For:

- [ ] Construction Charges
- [ ] Electricity

Email *

rachel.alonso@sfdpw.org

Business Mailing Address *

49 South Van Ness, 10th floor
San Francisco, CA 94103

Daytime Phone *

628-271-2838

Cell Phone *

805-452-3125

Owner/Developer Information (if different from Applicant)

Company/Agency Name
SFMTA

Contact Name & Title
Licinia Iberri

Invoice For:
- [x] Construction Charges
- [x] Electricity

Business Mailing Address
1 South Van Ness, 8th floor
San Francisco, CA 94103

Daytime Phone
415-646-2715

Cell Phone
###-###-####

Representative Information (if different from Applicant/Owner)

Company/Agency Name

Contact Name & Title

Invoice For:
- [ ] Construction Charges
- [ ] Electricity

Email

Business Mailing Address

Daytime Phone
###-###-####

Cell Phone
###-###-####

Electric Load Information

Complete one Load Summary for each Service Point. Add additional service points to Notes

Service Equipment Rating (amps)
600

Meter Disconnect Rating (amps)
600

Voltage
- ○ 120/208 Volt, 3-wire, 1ϕ
- ○ 120/240 Volt, 3-wire, 1ϕ
- ○ 208/120 Volt, 4-wire, 3ϕ
- ○ 240/120 Volt, 4-wire, 3ϕ
- ○ 480/277 Volt, 4-wire, 3ϕ
- ◉ Primary Voltage (>or equal 2,400 Volts)
- ○ Other

Single Phase Circuit

Service Point Description/Location

	Quantity	Load Each (kVA)	1ϕ Load Total (kVA)	CALCULATIONS FOR INTERNAL USE: Reserve Capacity (kVA)
Lighting	NA	NA		0
Receptacles	NA	NA		0
Electric Water Heating			0	0
Electric Heating			0	0
Commercial Cooking			0	0
Refrigeration			0	0
Resistance Welders			0	0
Arc Welders (Largest Unit)			0	0
EV Charging Station			0	0
Other 1 (Describe)			0	0
Other 2 (Describe)			0	0
Total (kVA)	NA	NA	0	0

"Other 1" Description

"Other 2" Description

Single Phase Horsepower
(Note: hp will be converted to kVA at 0.746)

	Quantity	Load Each (hp)	1ϕ Load Total (kVA)	CALCULATIONS FOR INTERNAL USE: Reserve Capacity (kVA)
Air Conditioning			0	0.000
Elevators			0	0.000
Fire Pump			0	0.000

	Quantity	Load Each (hp)	1ϕ Load Total (kVA)	CALCULATIONS FOR INTERNAL USE: Reserve Capacity (kVA)
Other (Describe)			0	0.000
Total (hp)	NA	NA	0	0.000

"Other" Description

	Largest Motor:	Motors 40 hp & above:
Type		
Rated hp		
Locked-rotor current (amps)		
Motor Use		

Three Phase Circuit

Service Point Description/Location

Feeder #1

	Quantity	Load Each (kVA)	3ϕ Load Total (kVA)	CALCULATIONS FOR INTERNAL USE: Reserve Capacity (kVA)
Lighting				0
Receptacles				0
Water Heating			0	0
Electric Heating			0	0
Commercial Cooking			0	0
Refrigeration			0	0
Resistance Welders			0	0
Arc Welders (Largest Unit)			0	0
EV Charging Station	90	205	18450	6457.5
Other 1 (Describe)			0	0
Other 2 (Describe)			0	0
Total (kVA)	NA	NA	18450	6457.5

"Other 1" Description

"Other 2" Description

Three Phase Horsepower
(Note: hp will be converted to kVA at 0.746)

	Quantity	Load Each (hp)	3ϕ Load Total (kVA)	CALCULATIONS FOR INTERNAL USE: Reserve Capacity (kVA)
Air Conditioning			0	0.000
Elevators			0	0.000
Fire Pump			0	0.000
Other (Describe)			0	0.000
Total (hp)	NA	NA	0	0.000

"Other" Description

	Largest Motor:	Motors 40 hp & above:
Type		
Rated hp		
Locked-rotor current (amps)		
Motor Use		

Ramp Up Schedule

When will the load reach the below percentages of total forecast?

	Estimated Week from Service Energization:
25% of Electrical Load	104 *
50% of Electrical Load	104 *
75% of Electrical Load	234 *
100% of Electrical Load	234 *

Street/Sidewalk Improvement

Does the project include any street/sidewalk improvement along public streets?
- ○ No
- ◉ Yes

If yes, contact slengineering@sfwater.org .

Customer Self Generation and Net Energy Metering

This Application form is for electric service only. The installation and interconnection of self-generation equipment, including photovoltaic systems, requires the submission of an interconnection application and SFPUC approval. Please contact hhpower@sfwater.org for more assistance.

Do you plan to install onsite self-generation equipment?
- ◉ Yes
- ○ No

Generation type:

Total output in kWAC

Attachments

A. Site Plan(s)

Drawn to scale, indicating proposed locations of electric metering (including any sprinkler controller meter), switchgear, and (if applicable) transformers. Show easements, rights-of-way, property lines, grading, roads, road names, sidewalks, driveways. Indicate location of fire hydrants and other structures, drains (water, sewer, storm) and proposed future improvements. **Minimum 300 dpi, include relevant directional, scale, legend, and context information.** Upload at least one file. *

Potrero Yard - 2500 Mariposa - floor plan.pdf ☐ Upload a different file

Potrero Yard - 2500 Mariposa - site survey.pdf ☐ Upload a different file

Choose File No file chosen

B. Building floor plans and exterior elevations

Minimum 300 dpi, Include relevant directional, scale, legend, and context information.

Choose File No file chosen

Choose File No file chosen

Choose File No file chosen

C. Electrical Drawings

Electrical drawings and schedules with complete breakdown of equipment, including electric switchboard drawings. Minimum 300 dpi, include relevant directional, scale, legend, and context information. Upload at least one file. *

Potrero Yard - 2500 Mariposa - electrical drawings.pdf ☐ Upload a different file

Choose File No file chosen

Choose File No file chosen

D. Single Line Diagrams

Single line diagram showing the meter, customer main service panel (and its main switch size), transformers (if any), poles, vaults, and /or junction boxes (if any). Minimum 300 dpi, include relevant directional, scale, legend, and context information. Upload at least one file. *

Potrero Yard - 2500 Mariposa - single line diagram feeder 1.pdf ☐ Upload a different file

Choose File No file chosen

Choose File No file chosen

E. Street Light and Traffic Signal Plans (if applicable)

If applicable. Minimum 300 dpi, include relevant directional, scale, legend, and context information.

Choose File No file chosen

Choose File No file chosen

F. Department of Building Inspection permit (if applicable)

Choose File No file chosen

G. Request for Unmetered Service (if applicable)

Choose File No file chosen

H. Proposed Joint Trench Agreement (if applicable)

Choose File No file chosen

Other Notes or Requests

Additional information, such as existing active WDT Application

This application covers the bus facility load and a portion of the battery electric bus charging load. NFPA70 Article 625 Sec42 states automatic load management system can be used for feeder rating. Based on modeling, estimated peak load with load management is 9,941kW. Designs include automatic load management and intelligent switchgear that can function as a backup to the load management limiting peak demand to 9,941kW. Second service requested for remainder of chargers

Acknowledgement

The applicant hereby applies to the SFPUC for electric service. Applicant acknowledges that this Application is subject to the SFPUC's *Rules and Regulations Governing Electric Service* that can be found at https://sfwater.org/ElectricRules .

By clicking "Submit" below, I agree that the information contained in this Application is correct to the best of my knowledge. I understand that any changes made to the above information or attached documents may increase the time and costs required for SFPUC to provide electric service at the requested service address and that I will be responsible for any increased costs resulting from such changes.

I understand that service will be engineered and installed based in part upon the information provided here. The SFPUC will provide the Applicant with a service agreement estimating the Applicant's cost responsibility. Subject to entering into a service agreement with the SFPUC, I agree to pay SFPUC for all work SFPUC performs and all costs SFPUC incurs to provide the service requested by this Application. SFPUC may cancel this project if I do not proceed with the project and it becomes inactive for 12 months. If the project is cancelled, by either party, I will pay SFPUC for all such work and costs incurred by SFPUC prior to the cancellation.

☑ I have read and agree to the terms above.

Contact Name & Title *

Rachel Alonso, Project Manager

Hidden Fields for Record Transfer to Salesforce (INTERNAL USE)

This is the default information for the required fields in Salesforce.

Opportunity Type

WDT Application

Close Date

06/01/2023

Stage

Pre-Application

Total Connected

18450

Reserve Capacity
6457.5

Summer Demand

	Residential	Light Commercial	Commercial	Industrial
1:00 AM				5628.650570865
2:00 AM				5538.270832605
3:00 AM				5457.51133578
4:00 AM				5439.261181567
5:00 AM				5518.66669562
6:00 AM				5761.193444685
7:00 AM				6066.57305598
8:00 AM				6145.98862436
9:00 AM				6245.81212059
10:00 AM				6295.66194773
11:00 AM				6382.82691647
12:00 PM				6419.647878525
1:00 PM				6430.51344883
2:00 PM				6427.62701736
3:00 PM				6457.04367430
4:00 PM				6420.24027020
5:00 PM				6457.5
6:00 PM				6415.09766572
7:00 PM				6375.24592125
8:00 PM				6297.43517723
9:00 PM				6136.528503105
10:00 PM				6002.52988923
11:00 PM				5843.304354195
12:00 AM				5695.510156875

Winter Demand

	Residential	Light Commercial	Commercial	Industrial
1:00 AM				5457.51133578
2:00 AM				5439.261181567
3:00 AM				5518.66669562
4:00 AM				5761.193444685
5:00 AM				6066.57305598
6:00 AM				6145.98862436
7:00 AM				6245.81212059

	Residential	Light Commercial	Commercial	Industrial
8:00 AM				6295.661947732
9:00 AM				6382.826916479
10:00 AM				6419.647878525
11:00 AM				6430.513448834
12:00 PM				6427.627017367
1:00 PM				6457.043674304
2:00 PM				6420.240270202
3:00 PM				6457.5
4:00 PM				6415.097665724
5:00 PM				6375.245921257
6:00 PM				6297.435177232
7:00 PM				6136.528503105
8:00 PM				6002.52988923
9:00 PM				5843.304354195
10:00 PM				5695.510156875
11:00 PM				5628.650570865
12:00 AM				5538.270832605

Submit

Contact Information

2. FEEDER 2 APPLICATION (MIXED USE LOAD)

This application covers housing and retail loads and a portion of the battery electric bus charging load. NFPA70 Article 625 Sec42 states automatic load management system can be used for feeder rating. Based on modeling, estimated peak load with load management is 2.8MW BEB chargers. New service estimate 5MW commercial, 3MW residential and 2.8MW BEB Chargers. Designs have automatic load management & intelligent switchgear that function as backup limiting peak demand to 10.8MW.

The total peak BEB charging load is ~12.7MW, split between two feeders. Feeder 1 is all BEB and anticipated to peak around 9.9 MW. Feeder 2 is mixed between BEB charging, residential, bus operations, and commercial uses. This totals 3MW peak for residential, 5MW for commercial/bus yard ops, and 2.8 MW for BEB charging. The connected load is higher than the peak load for BEBs because automatic load management systems should be used per NEC code Article 625 section 42.

APPLICATION FOR ELECTRIC SERVICE

Refer to the Application Checklist to complete this form. Submit separate forms for temporary construction power and permanent power.

Project Information

Project Name
Potrero Yard Modernization Project

Address *
2500 Mariposa Street, SF, CA 94110

Nearest cross street
Bryant Street

City *
San Francisco

Supervisorial District
10

Project Type
New Service

Load Type *
- ○ Residential
- ○ Light Commercial
- ○ Commercial (industrial secondary)
- ○ Industrial (industrial primary)
- ◉ Mixed Use
- ○ Other

Service Type
- ◉ Underground
- ○ Overhead

Service Duration *
- ◉ Permanent
- ○ Temporary

Will property be all electric? *
- ◉ Yes
- ○ No

Buy America Requirements/Federal Funding Restrictions?
- ○ Yes
- ◉ No

Date Electrical Service Requested
06/01/2023

Construction Start Date

Anticipated Contractor Bid Date

Number of Buildings
1

Number of Stories
13

Total Building Area
1300000

Existing Meter No.

Meter Room No. and Location

Number of Independent Electric Services

Number of Residential Units

Avg. Sq. Foot per Residential Unit
702

	Hours /Day	Days/Week	Months/Year	Business Hours
Summer Operating Hours	24	7	12	0:00 to 24:00

	Hours /Day	Days/Week	Months/Year	Business Hours
Winter Operating Hours	24	7	12	0:00 to 24:00

Description *

Brief description of the project and electric load type below. Please include the supply details, such as "irrigation pump" or "temporary construction power for new affordable housing development."

The Potrero Yard Modernization Project will demolish existing uses and construct a new 3-level bus maintenance and storage facility, equipped with battery electric bus infrastructure, up to 575 housing units, and ground floor retail as an integrated mixed-use development

Contact Information

Application submitted by

- (●) Owner/developer
- ( ) Electrical engineer
- ( ) Electrical contractor
- ( ) General contractor
- ( ) Architect
- ( ) Other

Applicant Information

Company/Agency Name

San Francisco Public Works

Contact Name & Title *

Rachel Alonso, Project Manager

Invoice For:

- [ ] Construction Charges
- [ ] Electricity

Email *

rachel.alonso@sfdpw.org

Business Mailing Address *

49 South Van Ness, 10th floor
San Francisco, CA 94103

Daytime Phone *

628-271-2838

Cell Phone *

805-452-3125

Owner/Developer Information (if different from Applicant)

Company/Agency Name
SFMTA

Contact Name & Title
Licinia Iberri

Invoice For:
- [x] Construction Charges
- [x] Electricity

Business Mailing Address
1 South Van Ness, 8th floor
San Francisco, CA 94103

Daytime Phone
415-646-2715

Cell Phone
###-###-####

Representative Information (if different from Applicant/Owner)

Company/Agency Name

Contact Name & Title

Invoice For:
- [ ] Construction Charges
- [ ] Electricity

Email

Business Mailing Address

Daytime Phone
###-###-####

Cell Phone
###-###-####

Electric Load Information

Complete one Load Summary for each Service Point. Add additional service points to Notes

Service Equipment Rating (amps)
600

Meter Disconnect Rating (amps)
600

Voltage
- ○ 120/208 Volt, 3-wire, 1ϕ
- ○ 120/240 Volt, 3-wire, 1ϕ
- ○ 208/120 Volt, 4-wire, 3ϕ
- ○ 240/120 Volt, 4-wire, 3ϕ
- ○ 480/277 Volt, 4-wire, 3ϕ
- ◉ Primary Voltage (>or equal 2,400 Volts)
- ○ Other

Single Phase Circuit

Service Point Description/Location

	Quantity	Load Each (kVA)	1ϕ Load Total (kVA)	CALCULATIONS FOR INTERNAL USE: Reserve Capacity (kVA)
Lighting	NA	NA		0
Receptacles	NA	NA		0
Electric Water Heating			0	0
Electric Heating			0	0
Commercial Cooking			0	0
Refrigeration			0	0
Resistance Welders			0	0
Arc Welders (Largest Unit)			0	0
EV Charging Station			0	0
Other 1 (Describe)			0	0
Other 2 (Describe)			0	0
Total (kVA)	NA	NA	0	0

"Other 1" Description

"Other 2" Description

Single Phase Horsepower
(Note: hp will be converted to kVA at 0.746)

	Quantity	Load Each (hp)	1ϕ Load Total (kVA)	CALCULATIONS FOR INTERNAL USE: Reserve Capacity (kVA)
Air Conditioning			0	0.000
Elevators			0	0.000
Fire Pump			0	0.000

	Quantity	Load Each (hp)	1ϕ Load Total (kVA)	CALCULATIONS FOR INTERNAL USE: Reserve Capacity (kVA)
Other (Describe)			0	0.000
Total (hp)	NA	NA	0	0.000

"Other" Description

	Largest Motor:	Motors 40 hp & above:
Type		
Rated hp		
Locked-rotor current (amps)		
Motor Use		

Three Phase Circuit

Service Point Description/Location

Feeder 2

	Quantity	Load Each (kVA)	3ϕ Load Total (kVA)	CALCULATIONS FOR INTERNAL USE: Reserve Capacity (kVA)
Lighting			500.40	500.4
Receptacles			460.14	57.5175
Water Heating			0	0
Electric Heating	23	68.10	1566.3	1174.725
Commercial Cooking			0	0
Refrigeration			0	0
Resistance Welders			0	0
Arc Welders (Largest Unit)			0	0
EV Charging Station	26	205	5330	1865.499999999
Other 1 (Describe)	23	107.52	2472.96	865.536
Other 2 (Describe)	576	5.21	3000.96	1050.336
Total (kVA)	NA	NA	13330.75999999	5514.0145

"Other 1" Description

Commercial

"Other 2" Description

Residential

Three Phase Horsepower
(Note: hp will be converted to kVA at 0.746)

	Quantity	Load Each (hp)	3ϕ Load Total (kVA)	CALCULATIONS FOR INTERNAL USE: Reserve Capacity (kVA)
Air Conditioning			0	0.000
Elevators			0	0.000
Fire Pump			0	0.000
Other (Describe)			0	0.000
Total (hp)	NA	NA	0	0.000

"Other" Description

	Largest Motor:	Motors 40 hp & above:
Type		
Rated hp		
Locked-rotor current (amps)		
Motor Use		

Ramp Up Schedule

When will the load reach the below percentages of total forecast?

	Estimated Week from Service Energization:
25% of Electrical Load	4 *
50% of Electrical Load	8 *
75% of Electrical Load	12 *
100% of Electrical Load	104 *

Street/Sidewalk Improvement

Does the project include any street/sidewalk improvement along public streets?
- ○ No
- ◉ Yes

If yes, contact slengineering@sfwater.org .

Customer Self Generation and Net Energy Metering

This Application form is for electric service only. The installation and interconnection of self-generation equipment, including photovoltaic systems, requires the submission of an interconnection application and SFPUC approval. Please contact hhpower@sfwater.org for more assistance.

Do you plan to install onsite self-generation equipment?
- ◉ Yes
- ○ No

Generation type:

Total output in kWAC

Attachments

A. Site Plan(s)

Drawn to scale, indicating proposed locations of electric metering (including any sprinkler controller meter), switchgear, and (if applicable) transformers. Show easements, rights-of-way, property lines, grading, roads, road names, sidewalks, driveways. Indicate location of fire hydrants and other structures, drains (water, sewer, storm) and proposed future improvements. **Minimum 300 dpi, include relevant directional, scale, legend, and context information.** Upload at least one file. *

Potrero Yard - 2500 Mariposa - floor plan.pdf ☐ Upload a different file

Potrero Yard - 2500 Mariposa - site survey.pdf ☐ Upload a different file

Choose File No file chosen

B. Building floor plans and exterior elevations

Minimum 300 dpi, Include relevant directional, scale, legend, and context information.

Choose File No file chosen

Choose File No file chosen

Choose File No file chosen

C. Electrical Drawings

Electrical drawings and schedules with complete breakdown of equipment, including electric switchboard drawings. Minimum 300 dpi, include relevant directional, scale, legend, and context information. Upload at least one file. *

Potrero Yard - 2500 Mariposa - electrical drawings.pdf ☐ Upload a different file

Choose File No file chosen

Choose File No file chosen

D. Single Line Diagrams

Single line diagram showing the meter, customer main service panel (and its main switch size), transformers (if any), poles, vaults, and /or junction boxes (if any). Minimum 300 dpi, include relevant directional, scale, legend, and context information. Upload at least one file. *

Potrero Yard - 2500 Mariposa - single line diagram feeder 2.pdf ☐ Upload a different file

Choose File No file chosen

Choose File No file chosen

E. Street Light and Traffic Signal Plans (if applicable)

If applicable. Minimum 300 dpi, include relevant directional, scale, legend, and context information.

Choose File No file chosen

Choose File No file chosen

F. Department of Building Inspection permit (if applicable)

Choose File No file chosen

G. Request for Unmetered Service (if applicable)

Choose File No file chosen

H. Proposed Joint Trench Agreement (if applicable)

Choose File No file chosen

Other Notes or Requests

Additional information, such as existing active WDT Application

NOTE: This application covers housing and retail loads and a portion of the battery electric bus charging load. NFPA70 Article 625 Sec42 states automatic load management system can be used for feeder rating. Based on modeling, estimated peak load with load management is 2.8MW BEB chargers. New service estimate 5MW commercial, 3MW residential and 2.8MW BEB Chargers. Designs have automatic load management & intelligent switchgear that function as backup limiting

Acknowledgement

The applicant hereby applies to the SFPUC for electric service. Applicant acknowledges that this Application is subject to the SFPUC's *Rules and Regulations Governing Electric Service* that can be found at https://sfwater.org/ElectricRules .

By clicking "Submit" below, I agree that the information contained in this Application is correct to the best of my knowledge. I understand that any changes made to the above information or attached documents may increase the time and costs required for SFPUC to provide electric service at the requested service address and that I will be responsible for any increased costs resulting from such changes.

I understand that service will be engineered and installed based in part upon the information provided here. The SFPUC will provide the Applicant with a service agreement estimating the Applicant's cost responsibility. Subject to entering into a service agreement with the SFPUC, I agree to pay SFPUC for all work SFPUC performs and all costs SFPUC incurs to provide the service requested by this Application. SFPUC may cancel this project if I do not proceed with the project and it becomes inactive for 12 months. If the project is cancelled, by either party, I will pay SFPUC for all such work and costs incurred by SFPUC prior to the cancellation.

☑ I have read and agree to the terms above.

Contact Name & Title *

Rachel Alonso, Project Manager

Hidden Fields for Record Transfer to Salesforce (INTERNAL USE)

This is the default information for the required fields in Salesforce.

Opportunity Type

WDT Application

Close Date

06/01/2023

Stage

Pre-Application

Total Connected

13330.759999999998

Reserve Capacity
5514.0145

Summer Demand

	Residential	Light Commercial	Commercial	Industrial
1:00 AM				
2:00 AM				
3:00 AM				
4:00 AM				
5:00 AM				
6:00 AM				
7:00 AM				
8:00 AM				
9:00 AM				
10:00 AM				
11:00 AM				
12:00 PM				
1:00 PM				
2:00 PM				
3:00 PM				
4:00 PM				
5:00 PM				
6:00 PM				
7:00 PM				
8:00 PM				
9:00 PM				
10:00 PM				
11:00 PM				
12:00 AM				

Winter Demand

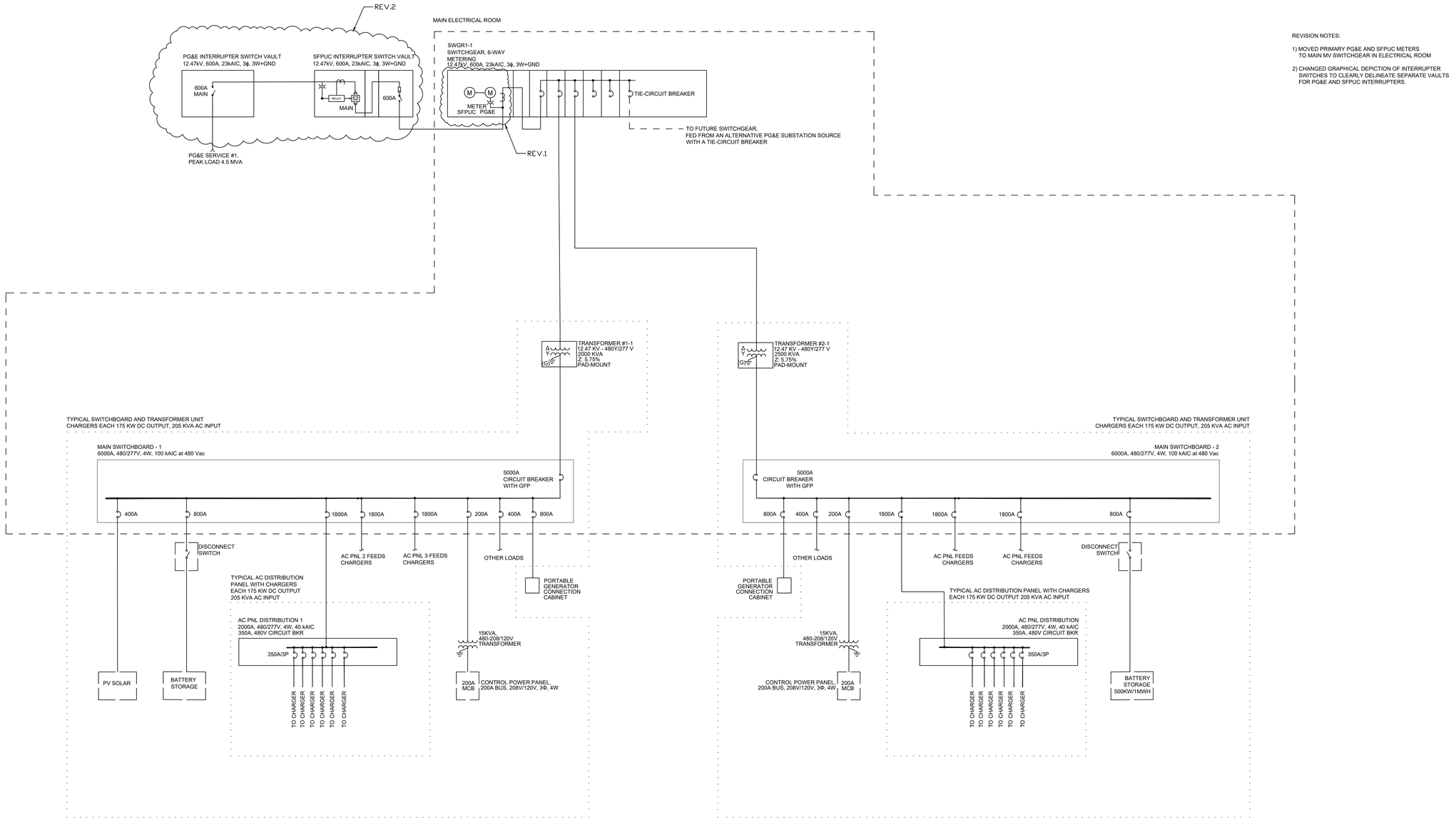
	Residential	Light Commercial	Commercial	Industrial
1:00 AM				
2:00 AM				
3:00 AM				
4:00 AM				
5:00 AM				
6:00 AM				
7:00 AM				
8:00 AM				
9:00 AM				
10:00 AM				
11:00 AM				

	Residential	Light Commercial	Commercial	Industrial
12:00 PM				
1:00 PM				
2:00 PM				
3:00 PM				
4:00 PM				
5:00 PM				
6:00 PM				
7:00 PM				
8:00 PM				
9:00 PM				
10:00 PM				
11:00 PM				
12:00 AM				

Submit

Contact Information

3. SINGLE LINE DIAGRAM FEEDER 1



REVISION NOTES:

1) MOVED PRIMARY PG&E AND SFPUC METERS TO MAIN MV SWITCHGEAR IN ELECTRICAL ROOM

2) CHANGED GRAPHICAL DEPICTION OF INTERRUPTER SWITCHES TO CLEARLY DELINEATE SEPARATE VAULTS FOR PG&E AND SFPUC INTERRUPTERS.

PROJECT NO.	189247
DRAWN BY	VGS Systems
DATE	08/04/21
SCALE	NTS

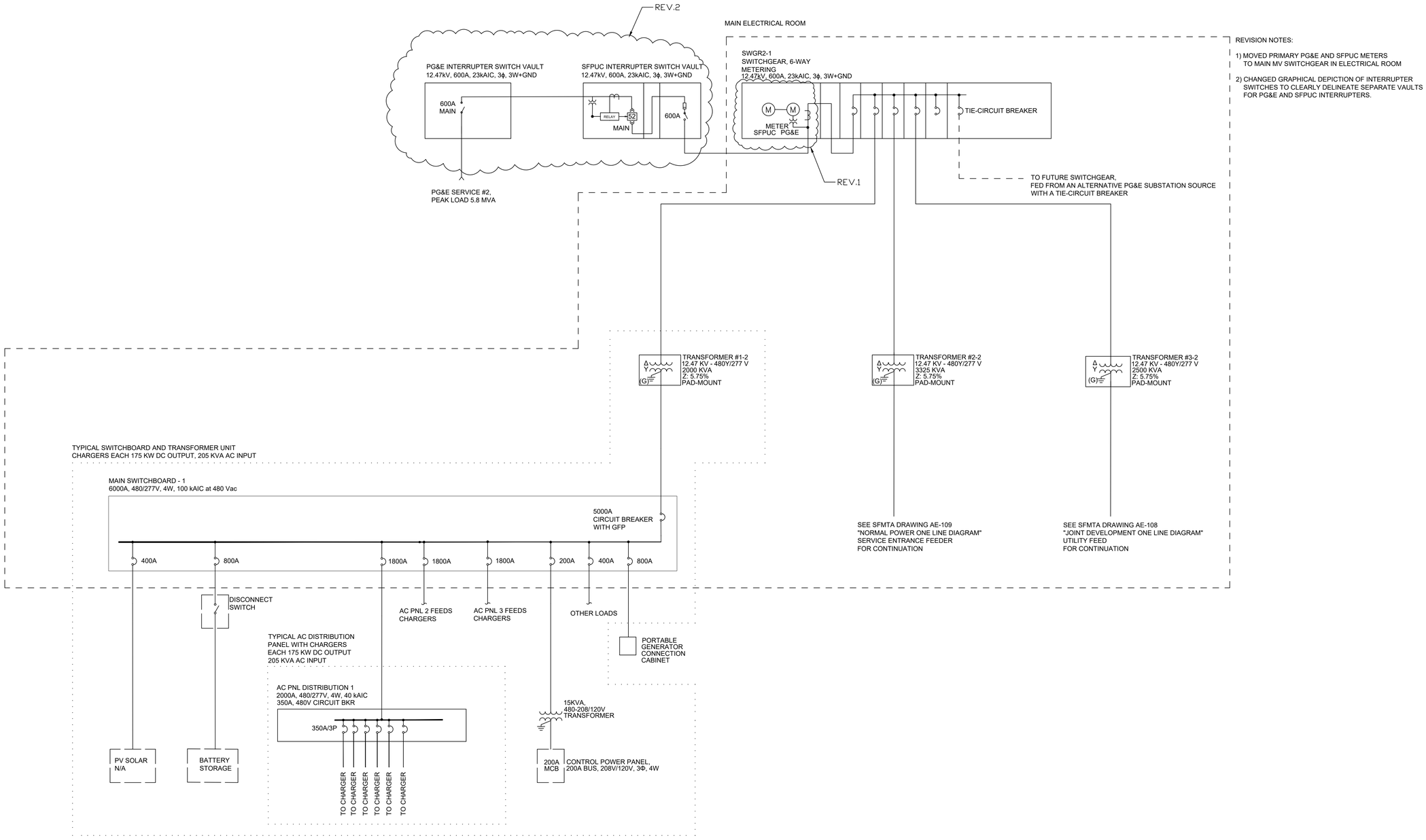
PROJECT TITLE
SFTMA ZE FACILITY PLAN

WSP USA Inc.
16200 PARK ROW
SUITE 200
HOUSTON, TEXAS 77084
TEL.: (281) 589-5900
FAX: (281) 759-5164

DRAWING TITLE
SINGLE-LINE DIAGRAM POTRERO YARD, SERVICE #1

DRAWING NUMBER
E.T.

4. SINGLE LINE DIAGRAM FEEDER 2



PROJECT NO.	189247
DRAWN BY	VGS Systems
DATE	08/04/21
SCALE	NTS

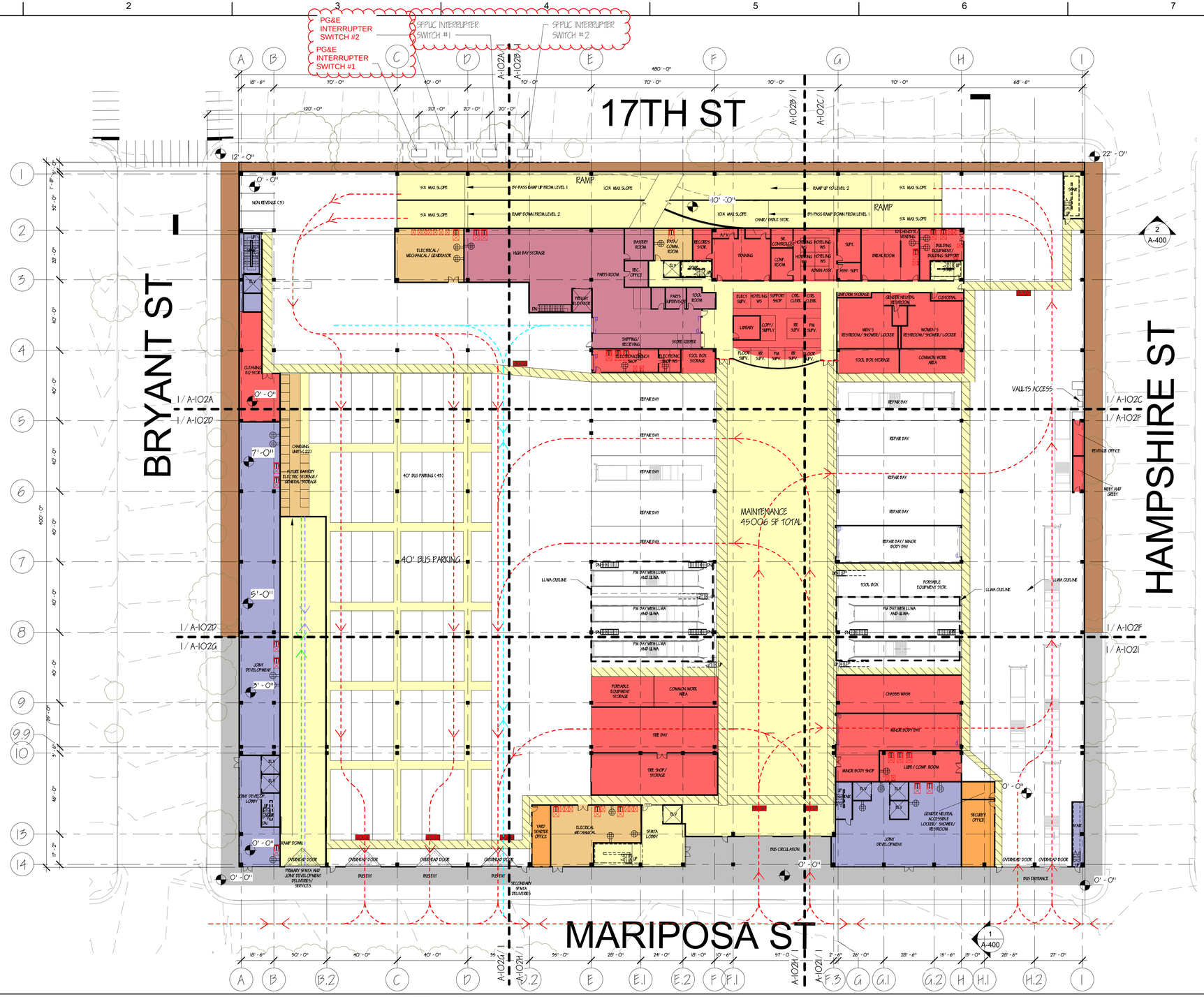
PROJECT TITLE
SFTMA ZE FACILITY
PLAN

WSP USA Inc.
16200 PARK ROW
SUITE 200
HOUSTON, TEXAS 77084
TEL: (281) 589-5900
FAX: (281) 759-5164

DRAWING TITLE
SINGLE-LINE DIAGRAM
POTRERO YARD,
SERVICE #2

DRAWING NUMBER
E.T.

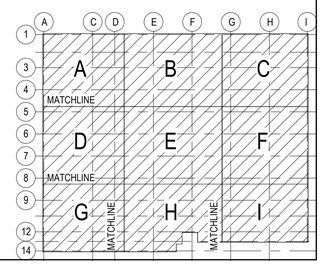
5. FLOOR PLAN



REVISION NOTES:
1) RENAMED INTERRUPTER SWITCH LOCATIONS FOR CLARITY
2) PRIMARY METERS TO BE LOCATED IN MAIN SWITCHGEAR IN MAIN ELECTRICAL ROOM
3) THERE ARE A TOTAL OF FOUR (4) UNDERGROUND VAULTS NEEDED FOR ELECTRICAL SERVICE. THERE ARE TWO (2) NEW SERVICES PLANNED AND EACH SERVICE REQUIRES TWO (2) INTERRUPTER VAULTS: ONE FOR THE PG&E INTERRUPTER AND ONE FOR THE SFPUC INTERRUPTER.
4) INTERRUPTER VAULT LOCATIONS ARE FIXED. LOCATION OF ALL ELECTRICAL WORK DOWNSTREAM OF THE INTERRUPTERS, INCLUDING THE LOCATION OF THE MAIN ELECTRICAL ROOM, IS AT THE DESCRETION OF THE DESIGNER.

- OPEN SPACE
- JOINT DEVELOPMENT
- MECH./ SERVICE
- PARTS
- SERVICE AND CLEAN
- PARKING
- OPERATIONS
- CIRCULATION
- MAINTENANCE
- TRAINING
- SFMTA DELIVERY PRIMARY
- JOINT DEVELOPMENT STORAGE/ SERVICE
- SFMTA BUS/ TROLLEY
- SFMTA DELIVERY SECONDARY

KEY PLAN



ISSUE	DATE	DESCRIPTION
3	March 13, 2020	Submittal
2	June 14, 2019	Draft Submittal
1	February 20, 2019	Draft Submittal

PROJECT MANAGER	
TEAM 1	Don Leidy
TEAM 2	Sheena Zimmerman
TEAM 3	Justin Kraegel
TEAM 4	Sara Jandaghi Jafari
TEAM 5	Jialing Sun
TEAM 6	Kashfi Kalam
TEAM 7	F. M. LAST
PROJECT NUMBER	10093201

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

SFMTA POTRERO SCENARIO 2 (3-LEVEL)

GROUND LEVEL- 1ST FLOOR OVERALL PLAN

0 30' 60'

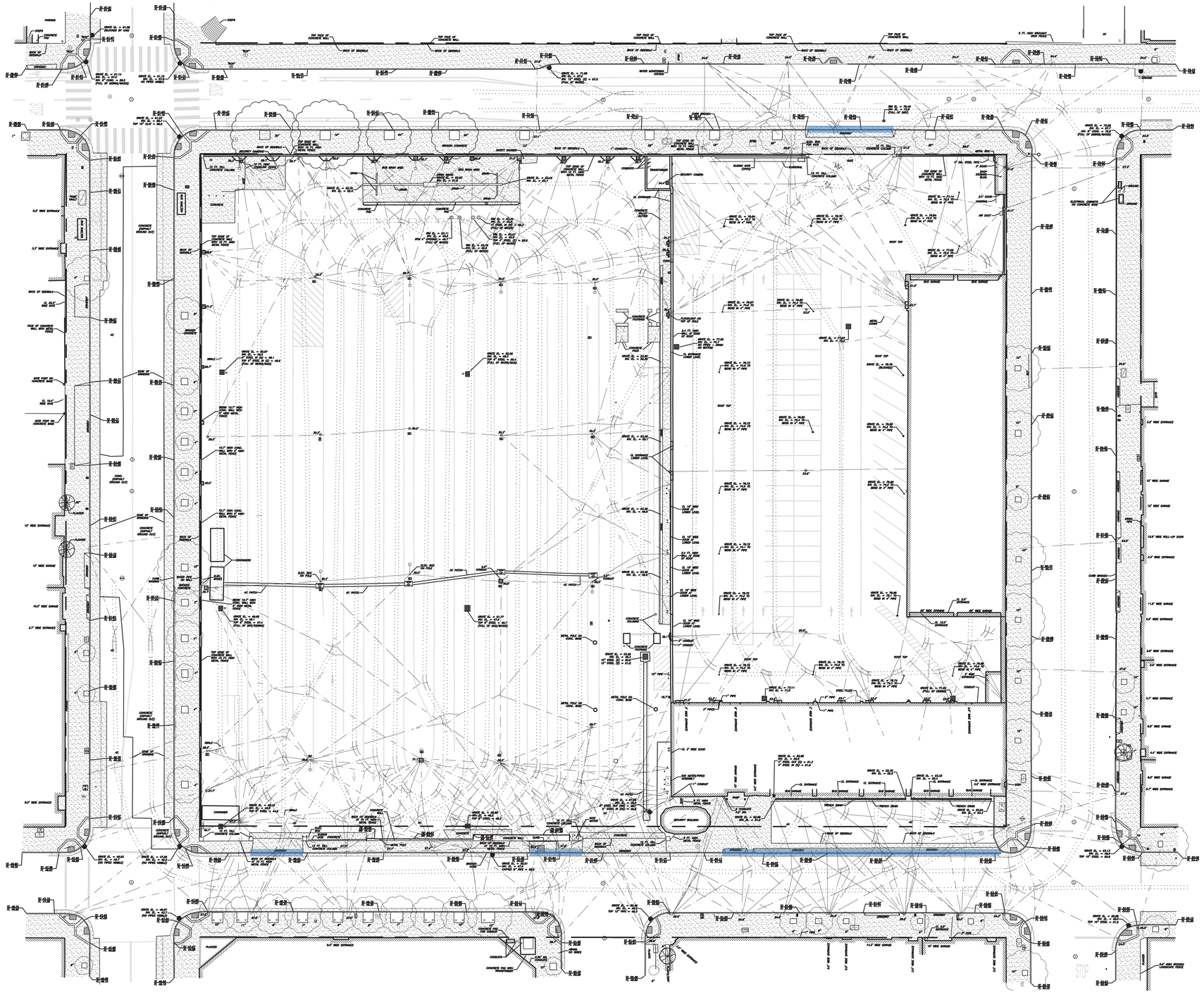
FILENAME: SFMTA_Potrero_AR_2018_3 LeveL

SCALE: 1" = 30'

SHEET: A-102

6. SITE SURVEY

Site Survey/ Existing Site Plan



Existing Curb Cuts

Site survey by Bureau of Street Use and Mapping San Francisco, City and County of San Francisco, 06/05/2017. Provided by SFMTA.

LEGEND

- BENCH MARK
- SURVEY CONTROL POINT
- BIKE RACK
- BOLLARD
- AREA DRAIN
- CATCH BASIN
- DRAIN
- CONDUIT
- ELECTRIC VAULT
- ELECTROLIER
- FIRE ALARM BOX
- FIRE HYDRANT
- FLOOD LIGHT
- HPFS HYDRANT
- HPFS VALVE
- FIRE HYDR VALVE
- GAS VALVE
- GATE POST
- GUY POLE
- GUY WIRE
- MUNI GUYPOLE
- MUNI GUYPOLE+LIGHT
- GROUND LIGHT
- MAIL BOX
- MAIL BOX RELAY
- MH ELEC
- MH HETCH HETCHY
- MH SEWER
- MH TELEPHONE
- MH UNKNOWN
- PG&E VAULT
- PIPE
- POWER POLE
- POWER POLE WITH COBRA LIGHT
- PULL BOX DTIS
- PULL BOX UNKNOWN
- PULL BOX CABLE TV
- PULL BOX ELECTRIC
- PULL BOX PG&E
- PULL BOX SHELTER
- PULL BOX STREET LIGHT
- PULL BOX TELEPHONE
- PULL BOX TV
- PULL BOX WATER
- SECURITY CAMERA
- SEWER CLEAN OUT
- SEWER
- SIGN POLE
- SIGN POLES
- STAND PIPE
- TELEPHONE POLE
- TELEPHONE VAULT
- TRASH CAN
- UNKNOWN UTILITIES
- WATER METER
- WATER VALVE
- TREE WITH DRIP LINE
- TRUNCATED DOME
- MUNI OVERHEAD TRANSMISSION CABLES
- MUNI TENSION CABLES
- RIGHT OF WAY
- CONCRETE
- BRICK
- BUILDING
- MAJOR CONTOUR (240)
- MINOR CONTOUR (235)

ABBREVIATIONS

AC = ASPHALT
BW = BOTTOM OF WALL
FL = FLOW LINE
TC = TOP OF CURB
TW = TOP OF WALL

Prepared by	Bureau of Street Use and Mapping
Project Address	2500 Mariposa St, San Francisco, CA 94110
Date	11/20/2019
Scale	1”=30”
Sheet Number	02

SFMTA

7. ELECTRICAL PLANS

ISSUE	DATE	DESCRIPTION
3	March 13, 2020	Submittal
2	June 14, 2019	Draft Submittal
1	February 20, 2019	Draft Submittal

PROJECT MANAGER	
TEAM 1	Don Leidy
TEAM 2	Sheena Zimmerman
TEAM 3	Justin Kraegel
TEAM 4	Sara Jandaghi Jafari
TEAM 5	Jialing Sun
TEAM 6	Kashfi Kalam
TEAM 7	F. M. LAST
PROJECT NUMBER	10093201

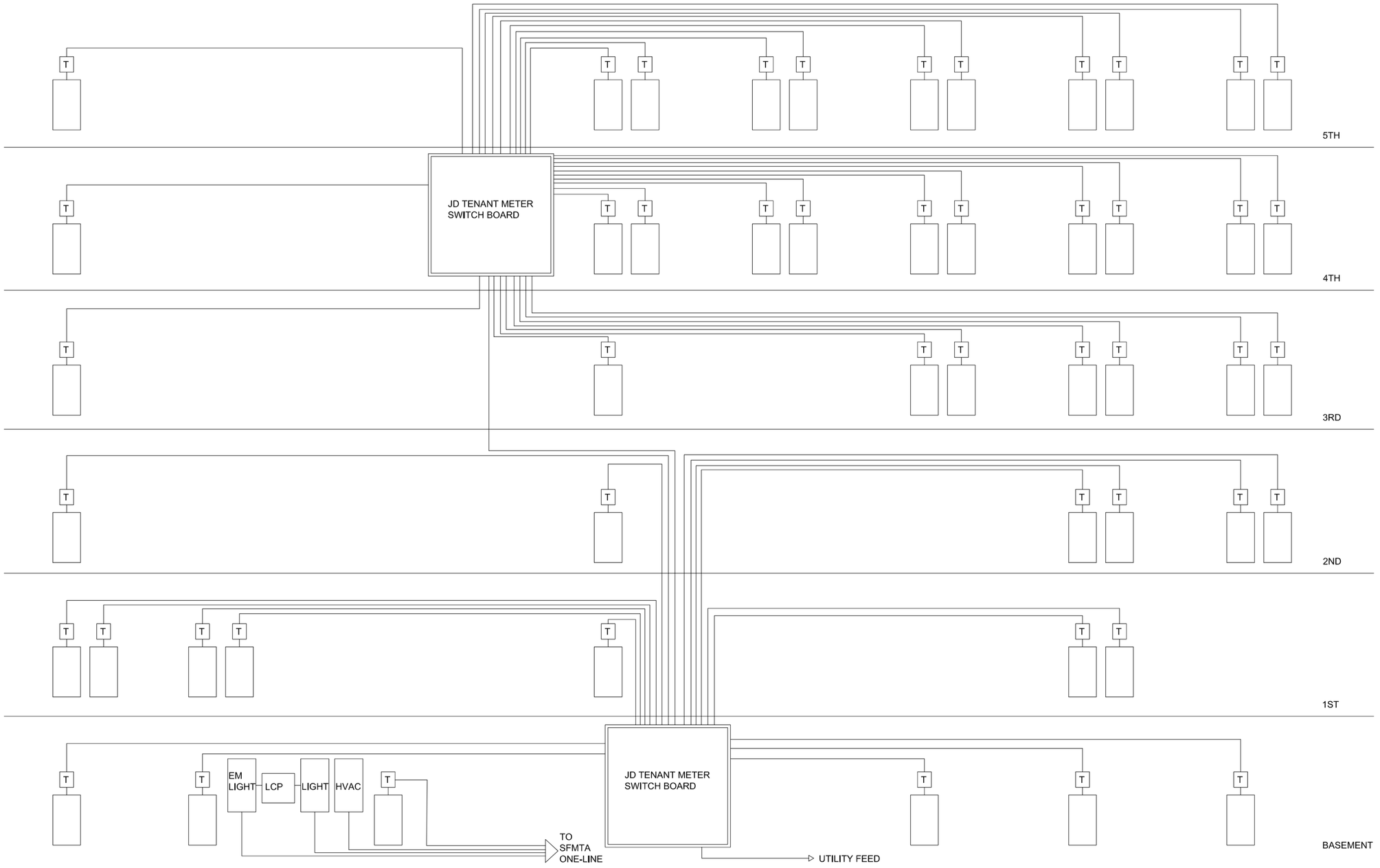
PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

SFMTA POTRERO SCENARIO 2 (3-LEVEL)

EMERGENCY POWER ONE LINE DIAGRAM- NTS

FILENAME	SFMTA_Potrero_AR_2018_3 LeveL	SHEET	AE-107
SCALE			

C:\rvt2018\SFMTA_Potrero_AR_2018_3 LeveL_ Central_kashfi.kalamXF6FA_06Apr2021_075440.rvt
4/6/2021 1:43:19 PM



C:\rvt2018\SFMTA_Potrero_AR_2018_3 LeveL_ Central_kashfi.kalamXF6FA_06Apr2021_075440.rvt
4/6/2021 1:43:20 PM

ISSUE	DATE	DESCRIPTION
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TEAM 5	Jialing Sun
TEAM 6	Kashfi Kalam
TEAM 7	F. M. LAST
PROJECT NUMBER	10093201

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

SFMTA POTRERO SCENARIO 2 (3-LEVEL)

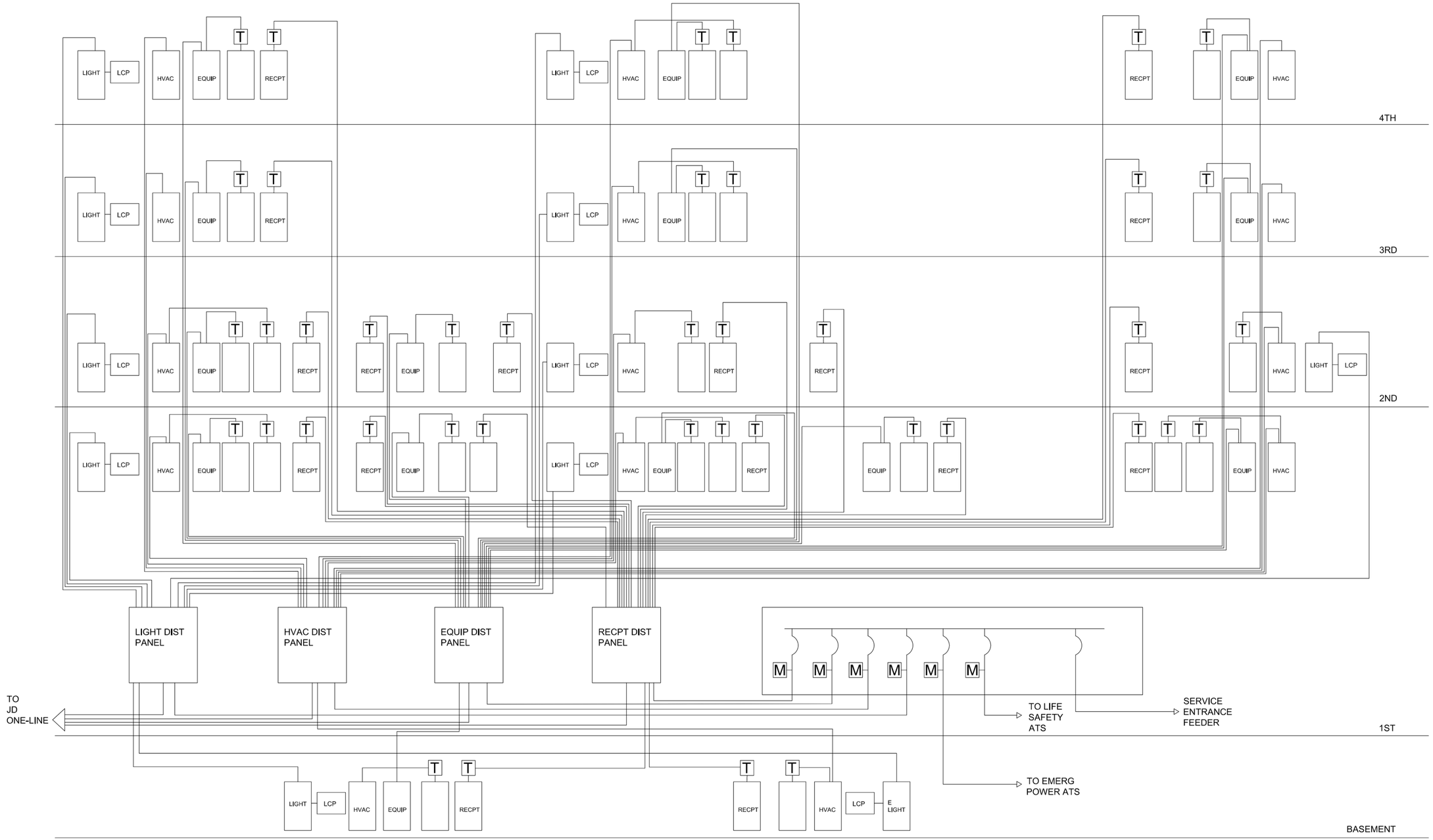
JOINT DEVELOPMENT ONE LINE DIAGRAM- NTS

0

FILENAME: SFMTA_Potrero_AR_2018_3 LeveL

SCALE

SHEET: **AE-108**



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TEAM 6	Kashfi Kalam
TEAM 7	F. M. LAST
PROJECT NUMBER	10093201

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

SFMTA POTRERO SCENARIO 2 (3-LEVEL)

NORMAL POWER ONE LINE DIAGRAM- NTS

0

FILENAME: SFMTA_Potrero_AR_2018_3 LeveL

SCALE:

SHEET: **AE-109**

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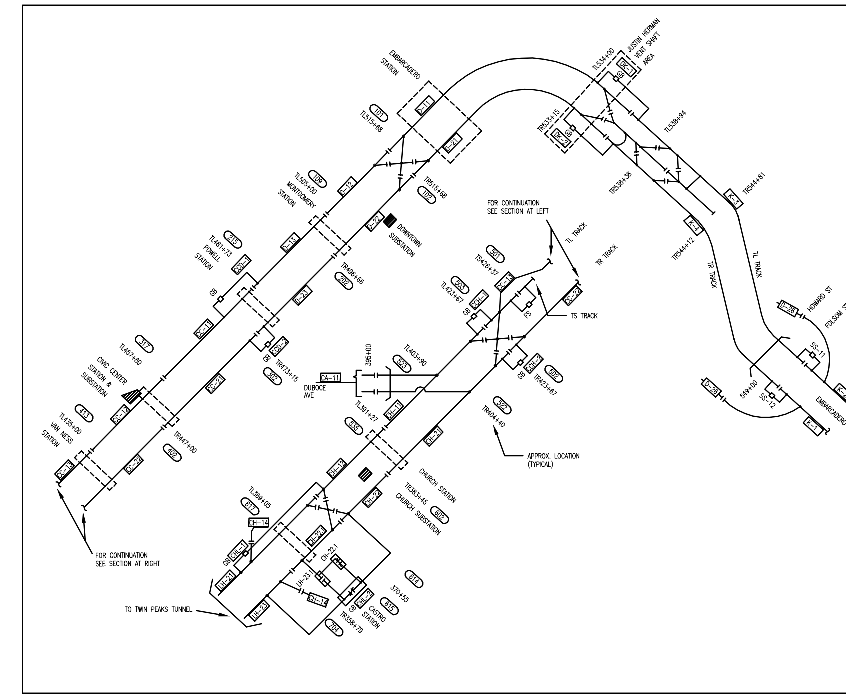
4/6/2021 1:43:20 PM

APPENDIX D:
TRACTION POWER FEEDER MAP

SYMBOLS	
(symbol)	CONNECTION BETWEEN TROLLEY WIRES
(symbol)	NO CONNECTION BETWEEN TROLLEY WIRES
(symbol)	TROLLEY SECTION BREAK
(symbol)	NO ELECTRICAL CONNECTION
MS 10	MANUAL SWITCH NUMBER
SS 8	SECTIONALIZING SWITCH NUMBER
SB 15	SECTIONALIZING BREAKER NUMBER
(symbol)	TROLLEY SECTION BREAK WITH JUMPER
GB	GAP BREAKER
WP-13	CIRCUIT BREAKER NUMBER
252+34	SURVEY STATION
101	LOCATION SIGN
OR (F)	FUTURE INSTALLATION



MARKET STREET SUBWAY SECTIONS

NOTES:

1. ONLY POSITIVE WIRES ARE SECTIONALIZED, ALL NEGATIVE WIRES, CABLES AND RAILS ARE CONNECTED IN COMMON.
2. FIGURES IN RECTANGLES THUS: [D-11] INDICATES FEED FROM DOWNTOWN SUBSTATION, FDR. BKR. NO. 11
   [RM-2] INDICATES FEED FROM RICHMOND SUBSTATION, FDR. BKR. NO. 2

SUBSTATIONS		
CODE	NAME	LOCATIONS
B	BRYANT	2502 ALAMEDA, EAST OF BRYANT
BA	BALBOA	682 32nd AVE AT BALBOA
BE	BERNAL (826-1085)	425 ANDOVER, SOUTH OF CORTLAND
CA	CARL	823 CLAYTON, NORTH OF CARL
CC	CIVIC CENTER	1150 MARKET, AT U.N. PLAZA
CH	CHURCH	2120 MARKET, WEST OF CHURCH
D	DOWNTOWN	79 STEVENSON, EAST OF 2nd
E	STATION E	200 LEXINGTON, AT 19th
F	FILLMORE	1825 FILLMORE, NORTH OF SUTTER
GP	GLEN PARK	100 RANDALL, AT MISSION OR SAN JOSE
I	ILLINOIS	555 ILLINOIS STREET AT MARIPOSA ST
J	STATION J	520 SACRAMENTO, AT LEIDESDORFF
JU	JUDAH	2710 JUDAH, WEST OF 32nd AVE.
K	KING	2 BERRY STREET, AT KING ST.
KE	KEITH	3400 KEITH ST AT LE CONTE
LH	LAGUNA HONDA	375 LAGUNA HONDA, AT LAUNDRY BLDG.
M	MARINA	1575 NORTH POINT, EAST OF BUCHANAN
MI	MICHIGAN	MME FACILITY BY 25TH ST & MICHIGAN
N	STATION N	1437 - 9TH AVE., SOUTH OF JUDAH
OM	OUTER MISSION	98 RUSSIA, AT LONDON
P	PHELPS	702 PHELPS ST AT HUDSON
RA	RANDOLPH	8 BYXBEE, NORTH OF RANDOLPH
RM	RICHMOND	435 - 8TH AVE., SOUTH OF GEARY
SJ	SAN JOSE	2200 SAN JOSE, AT OCEAN
T	TARAVAL	3027 TARAVAL, WEST OF 40TH AVE.
WP	WEST PORTAL	145 LENOX, NORTH OF ULLOA

IN EMERGENCY NOTIFY: POWER CONTROL CENTER 554-9204
CENTRAL CONTROL 759-4321

CITY AND COUNTY OF SAN FRANCISCO

PUBLIC TRANSPORTATION DEPARTMENT
TRANSIT POWER FACILITIES

MUNICIPAL RAILWAY
TROLLEY SECTIONS

BY	R.E.C.	DR.	R.E.C.	SCALE:	NONE	DATE:	MARCH, 1979
CH.	J.M.W.	OK.	F.L.R.	APPROVED:	A. O. OLSON, MANAGER AND CHIEF ENGINEER	DRAWING NO.	D-2200
APPROVED.	L. M. PERSON / RAY QUAN						

PROJ. NO./FILENAME : MCAP_2\MCD ELECT RECORDS\city map 2200\D-2200R10

NO.	DATE	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED BY
7	11-15-02	REVISED BOUNDARIES FOR CKTS BA-1, CC-14, CH-14, & D-17.	Z. Q. / E. V.	Q. X.	C. J. WEN
6	08-29-02	REVISED BOUNDARIES FOR CKTS D-17, D-24, K-5, & K-6.	Z. Q. / E. V.	R. D.	C. J. WEN
5	04-18-02	REVISED BOUNDARIES FOR CKT D-25	Z. Q. / M. A.	Q. X.	T. Q.
4	02-26-02	REVISED BOUNDARIES FOR CKTS K-3, K-4, D-17, D-24, & D-26	R. D. / T. N.	T. Q.	C. J. WEN
3	12-28-01	UPDATED DRAWING TO INCLUDE 3RD ST LIGHT RAIL PROJECT	M.G./F.LEUNG	F.LEUNG	C. J. WEN
2	04-14-00	REVISED CKT K1 TO K6 AND D26; REVISED CKT SS-2 TO MS-3	W. S. / J. HO	J. HO	C. J. WEN
1	03-26-98	REVISED AND UPDATED DRAWING TO AUTOCAD	W. S. / M. L.	M. L.	C. J. WEN

REVISIONS

NO.	DATE	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED BY
10	03-21-12	ADDED ADDED D27 AND REVISED JS	J.HO	F.L.	F.E.
9	12-11-07	ADDED T-LINE, REVISED CH-22.1	J.F.	F.L.	F.E.
8	05-23-05	REVISED CKTS B-3, B-4, B-7, BE-1, D-16, D-26, E-3, & GP-1.	C. J. WEN	C. J. WEN	C. J. WEN

REVISIONS

NO.	DATE	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED BY

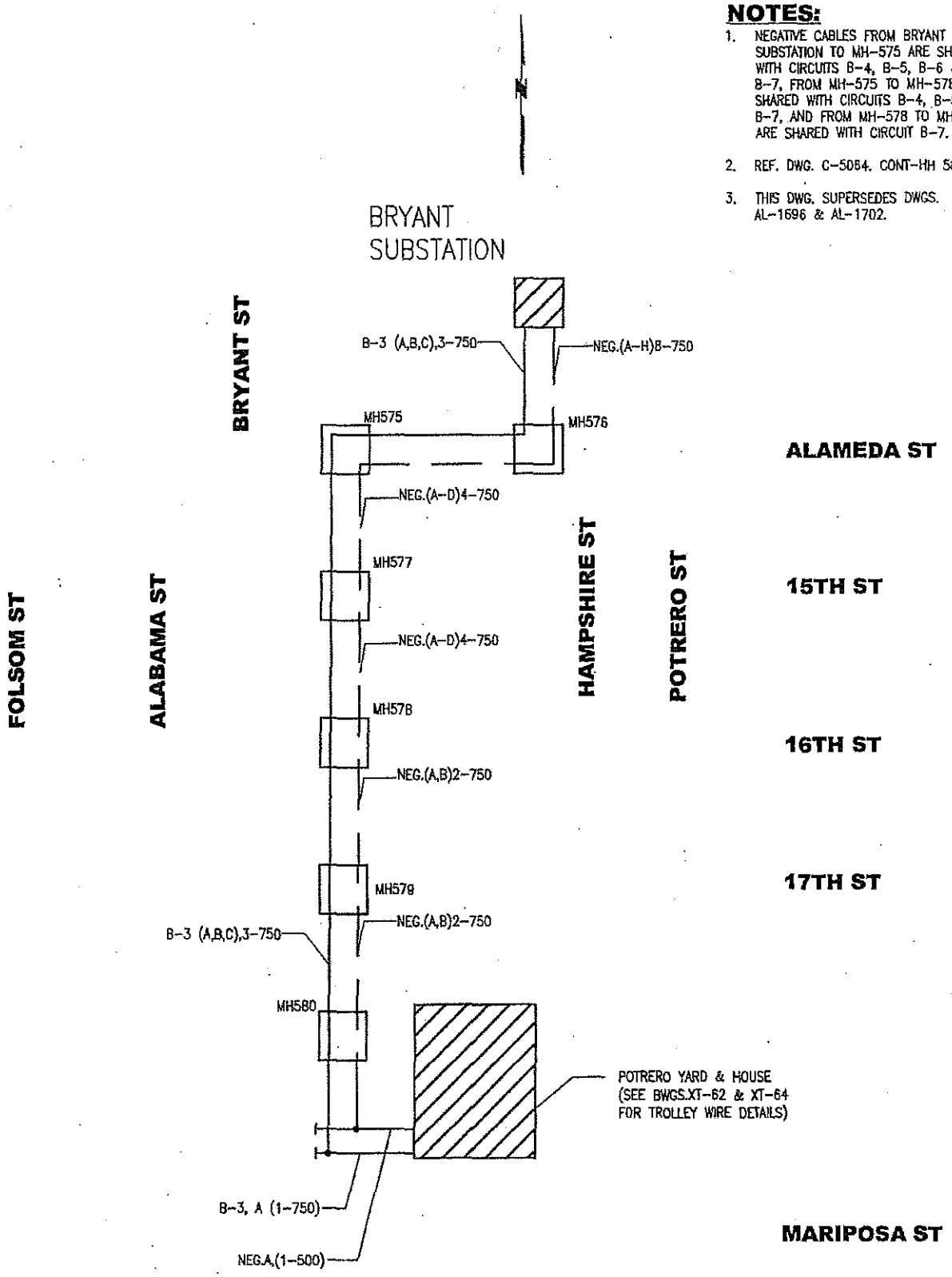
REVISIONS

FEEDER B-3

MANHOLE #	LOCATION	COMMENTS
MH 576	IFO Bryant Substation	
MH 575	Alameda & Bryant	
MH 577	N/E 15th St. & Bryant	
MH 578	N/E 16th St. & Bryant	
MH 579	W/S Bryant S/O 17th St.	
MH 580	IFO Abbet Electric	

NOTES:

1. NEGATIVE CABLES FROM BRYANT SUBSTATION TO MH-575 ARE SHARE WITH CIRCUITS B-4, B-5, B-6 & B-7, FROM MH-575 TO MH-578 ARE SHARED WITH CIRCUITS B-4, B-5 & B-7, AND FROM MH-578 TO MH-580 ARE SHARED WITH CIRCUIT B-7.
2. REF. DWG. C-5084. CONT-HH 586.
3. THIS DWG. SUPERSEDES DWGS. AL-1696 & AL-1702.



CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

MUNICIPAL RAILWAY FEEDER DIAGRAM

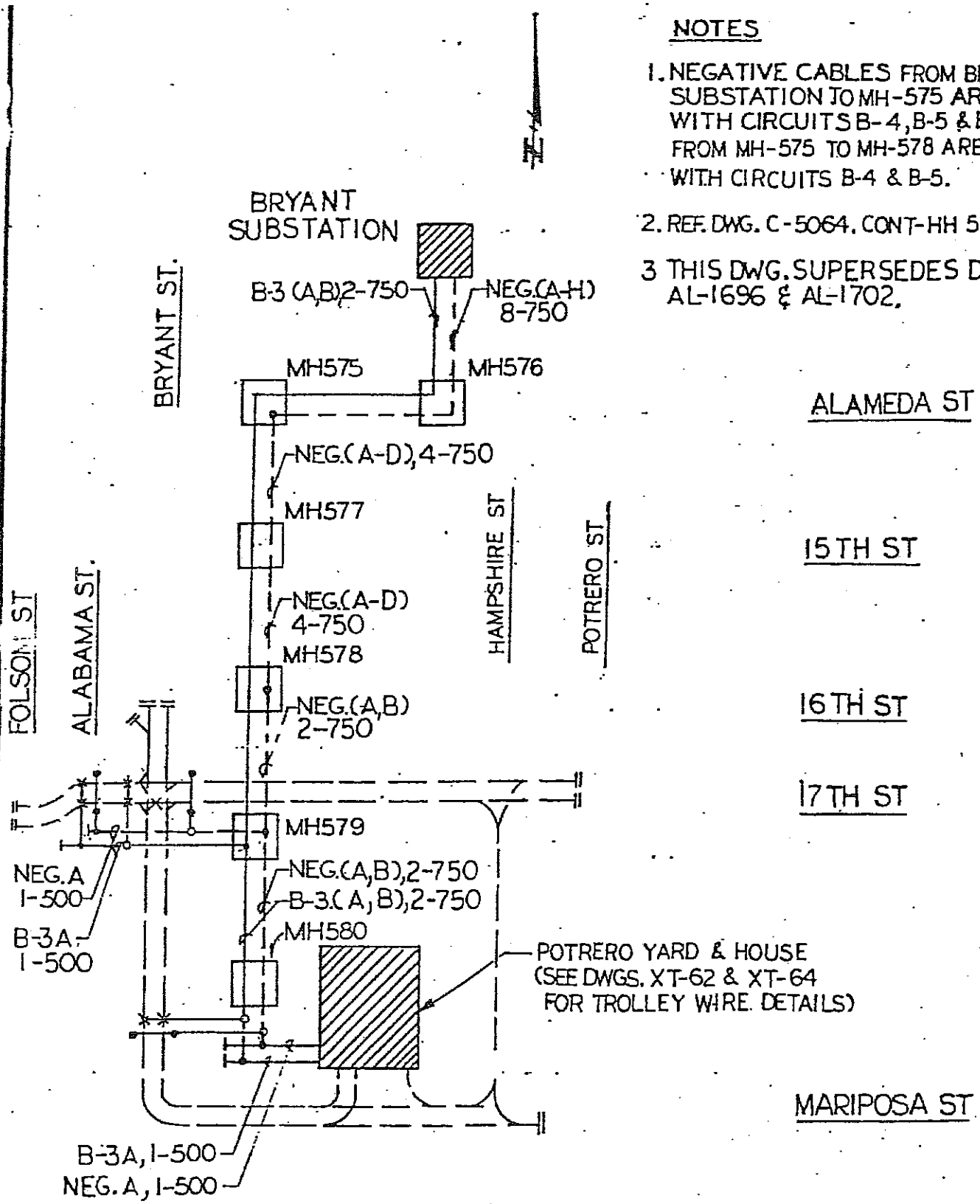
FEEDER B-3

NO	DATE	DESCRIPTION	BY	CH	APPR'D
		REVISIONS			

BY	TR	APPROVED	SCALE	DATE	LATEST REVISION
DR	CH	APPROVED		DRAWING NO	REVISION NO
RECOMMENDED					

NOTES

1. NEGATIVE CABLES FROM BRYANT SUBSTATION TO MH-575 ARE SHARE WITH CIRCUITS B-4, B-5 & B-6, AND FROM MH-575 TO MH-578 ARE SHARED WITH CIRCUITS B-4 & B-5.
2. REF. DWG. C-5064. CONT-HH 586.
3. THIS DWG. SUPERSEDES DWGS. AL-1696 & AL-1702.



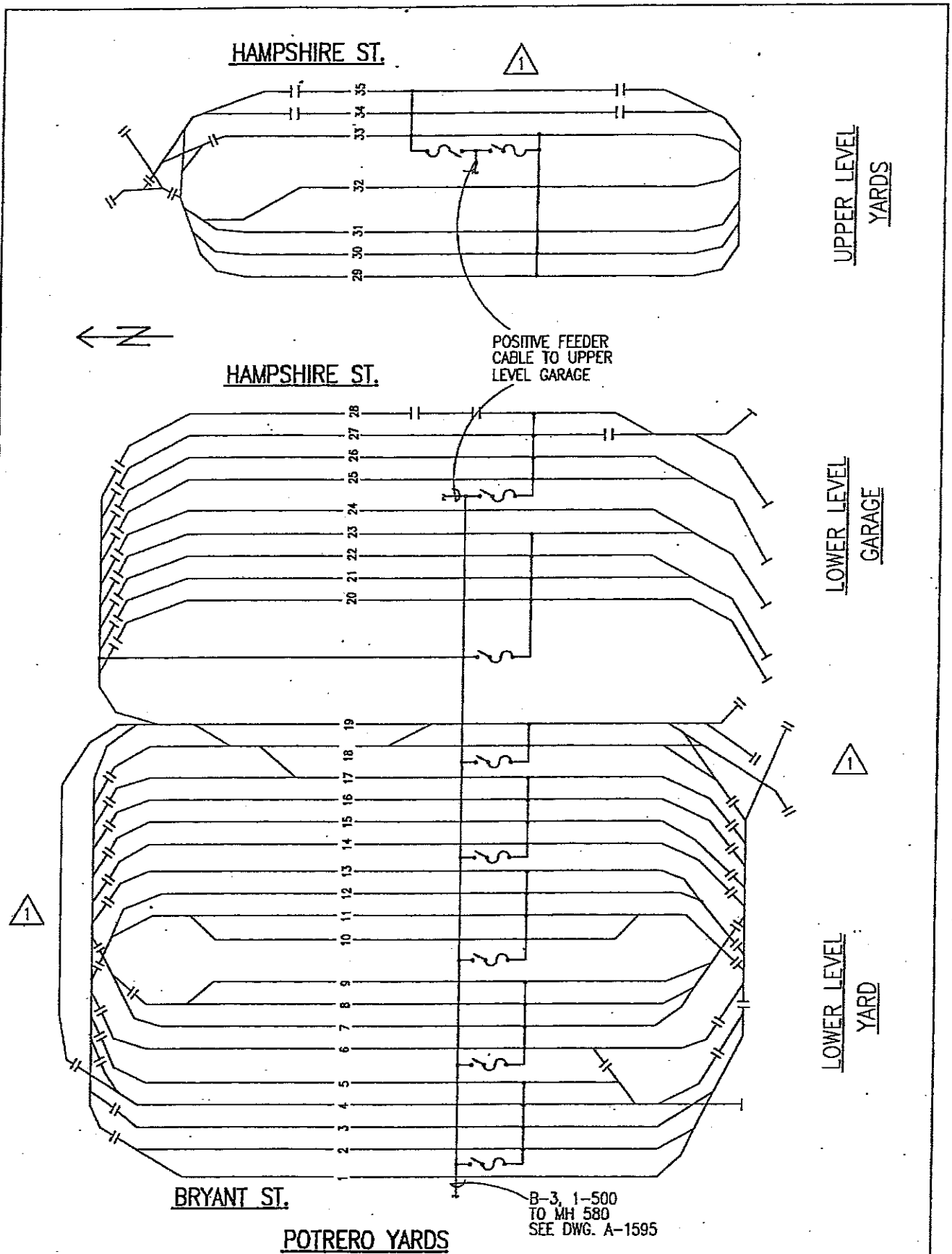
CITY AND COUNTY OF SAN FRANCISCO — PUBLIC UTILITIES COMMISSION

HETCH HETCHY WATER AND POWER

MUNICIPAL RAILWAY FEEDER DIAGRAM

FEEDER B-3

BY TBQ	TR.	APPROVED	SCALE NONE	DATE AUG. 1980	LATEST REVISION —
DR.	CH.	APPROVED	APPROVED	DRAWING NO.	REVISION NO.



POTRERO YARDS

NOTE:
1. THIS DWG. SUPERSEDES DWG. AL-1702

CITY AND COUNTY OF SAN FRANCIOCO
HETCH HETCHY WATER AND POWER

TRANSIT POWER DIVISION

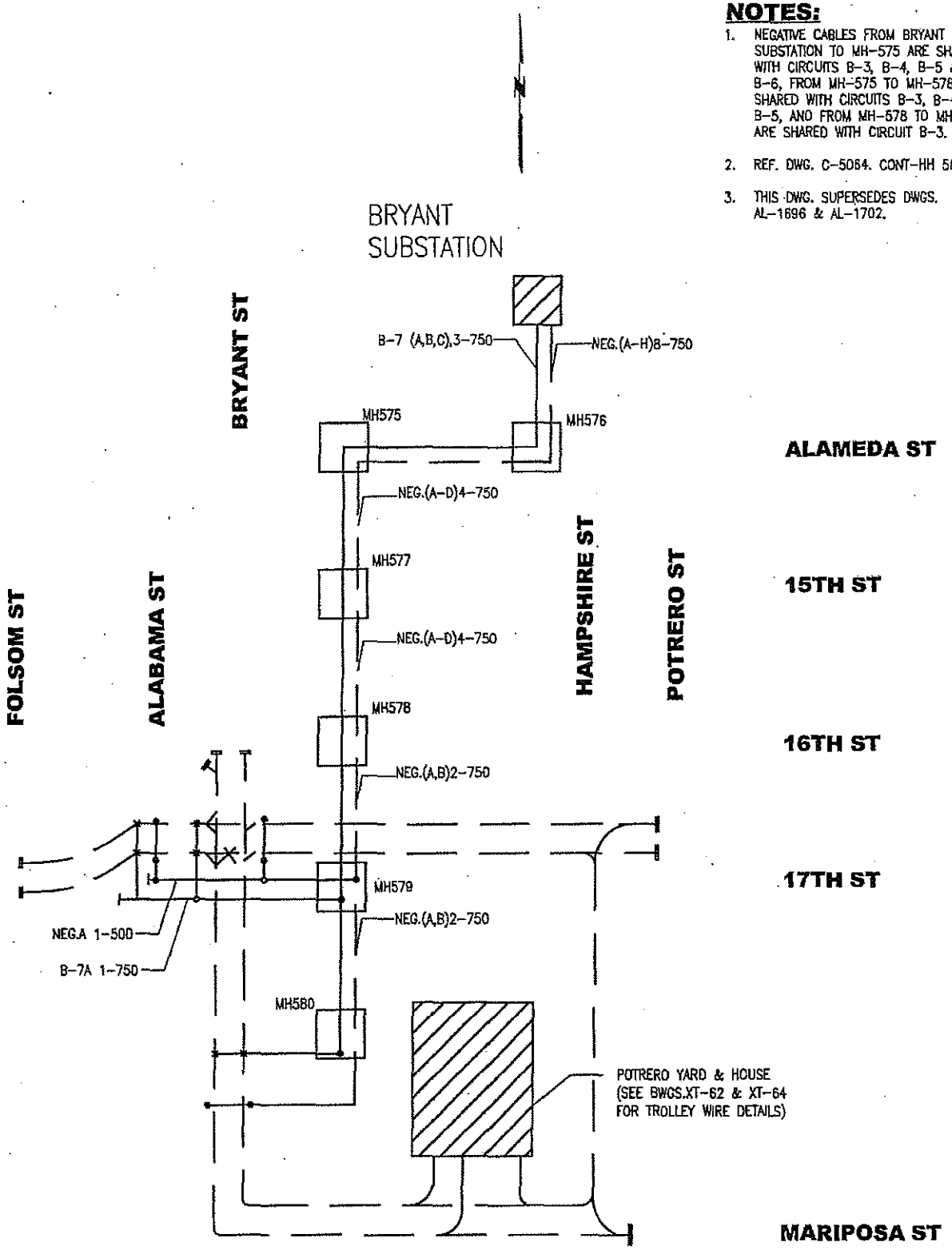
FEEDER B-3 (YARD)

NO.	DATE	DESCRIPTION	BY	APPVD.
1	JAN/95	ADDED MORE LANES	AZ	CJM

BY RK | DR. | CH. | APPROVED | APPROVED | SCALE | DATE APR. 83 | DRAWING NO. | LATEST REVISION | REVISION NO.

NOTES:

1. NEGATIVE CABLES FROM BRYANT SUBSTATION TO MH-575 ARE SHARE WITH CIRCUITS B-3, B-4, B-5 & B-6, FROM MH-575 TO MH-578 ARE SHARED WITH CIRCUITS B-3, B-4, & B-5, AND FROM MH-578 TO MH-580 ARE SHARED WITH CIRCUIT B-3.
2. REF. DWG. C-5084. CONT-HH 586.
3. THIS DWG. SUPERSEDES DWGS. AL-1696 & AL-1702.



CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

MUNICIPAL RAILWAY FEEDER DIAGRAM

FEEDER B-7

NO	DATE	DESCRIPTION	BY	CH	APP'D
		REVISIONS			

BY	TR	APPROVED	SCALE	DATE	LATEST REVISION
DR	CH	APPROVED		DRAWING NO	REVISION NO
RECOMMENDED					

APPENDIX E:
SAMPLE ROUTE SCHEDULES

SEE PAGE 9 FOR 30 LINE THAT NEED TO PULL OUT FROM PRESIDIO
SEE PAGE 10 FOR 6 & 22 LINE THAT NEED TO PULL OUT FROM PRESIDIO

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____ (DAY / DATE)

DIVISION: POTRERO

SERVICE : WEEKDAY

COACH ASSIGNMENT, OPERATOR REPORT AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PANDTS O	PULL OUT	PULL IN	CAR COACH	TBRACTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
104	1401		TC60		356A	128X			301		A			
103	501		TC60		419A	1259X			304		B			
102	1402		TC60		426A	1058P			306		C			
101	1403		TC60		436A	628P			308		D			
100	502		TC60		439A	948P			309		E			
99	2201		ET40		440A	755P			310		A			
98	1404		TC60		441A	1010P			311		F			
97	1405		TC60		447A	822P			313		G			
96	503		TC60		450A	1041P			314		H			
95	2202		ET40		453A	810P			315		B			
94	1406		TC60		456A	1013P			318		I			
93	504		TC60		456A	834P			319		J			
92	1407		TC60		503A	1046P			321		I			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____ (DAY / DATE)

DIVISION: POTRERO

SERVICE : WEEKDAY

COACH ASSIGNMENT, OPERATOR REPORT AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PAN DTS O	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
91	2203		ET40		506A	825P			322		C			
90	601		ET40		508A	811P			317		D			
89	1408		TC60		509A	213X			323		J			
88	3021		TC60		511A	707P			326		A			
87	3301		ET40		515A	743P			327		E			
86	1409		TC60		516A	151X			328		B			
85	1410		TC60		517A	746P			330		C			
84	505		TC60		517A	853P			329		D			
83	2204		ET40		518A	840P			332		F			
82	3009		ET40		518A	837P			331		G			
81	1411		TC60		521A	1034P			334		E			
80	602		ET40		522A	722P			324		H			
79	1412		TC60		524A	846P			335		F			
78	2205		ET40		530A	1032P			336		I			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____ (DAY / DATE)

DIVISION: POTRERO

SERVICE : WEEKDAY

COACH ASSIGNMENT, OPERATOR REPORT AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PAN DTS O	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
77	603		ET40		534A	737P			333		J			
76	3302		ET40		535A	110X			338		A			
75	1413		TC60		536A	254X			339		G			
74	506		TC60		538A	905P			340		H			
73	2206		ET40		542A	718P			342		B			
72	3022		TC60		542A	753P			343		I			
71	507		TC60		545A	923P			345		J			
70	3304		ET40		546A	1250X			346		C			
69	604		ET40		546A	1101A			337		D			
68	3303		ET40		550A	140X			347		E			
67	1414		TC60		551A	806P			348		A			
66	2207		ET40		551A	918P			350		F			
65	605		ET40		551A	105X			341		G			
64	2208		ET40		557A	910P			352		H			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POTRERO

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : WEEKDAY AND COACH MILEAGE RECORD PAGE 4 OF 10

COUNT	TRAIN	HOLD	TYPE	PAN DTS O	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
63	606		ET40		557A	136X			344		I			
62	2209		ET40		600A	933P			354		J			
61	2210		ET40		603A	741P			356		A			
60	3306		ET40		603A	1014P			357		B			
59	508		TC60		603A	1133P			355		B			
58	3305		ET40		606A	120X			359		C			
57	509		TC60		606A	750P			360		C			
56	607		ET40		609A	847P			351		D			
55	3023		TC60		613A	650P			362		D			
54	608		ET40		618A	115X			358		E			
53	3012		ET40		622A	807P			363		F			
52	2211		ET40		623A	115X			365		G			
51	510		TC60		623A	957P			364		E			
50	609		ET40		624A	135X			361		H			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POTRERO

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : WEEKDAY AND COACH MILEAGE RECORD PAGE 5 OF 10

COUNT	TRAIN	HOLD	TYPE	PAN DTS O	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
49	511		TC60		625A	118X			366		F			
48	1415		TC60		626A	1046A			367		G			
47	512		TC60		631A	1015P			369		H			
46	1416		TC60		634A	809P			370		I			
45	3307		ET40		636A	1111P			372		I			
44	2212		ET40		639A	1134P			373		J			
43	513		TC60		639A	910P			374		J			
42	2213		ET40		640A	1155P			375		A			
41	3024		TC60		641A	701P			376		A			
40	610		ET40		641A	854P			368		B			
39	514		TC60		646A	129X			377		B			
38	2214		ET40		654A	810P			378		C			
37	515		TC60		656A	1030P			380		C			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POTRERO

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : WEEKDAY AND COACH MILEAGE RECORD PAGE 6 OF 10

COUNT	TRAIN	HOLD	TYPE	PANDTOS	PULL OUT	PULL IN	CAR COACH	TBREARCTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
36	3025		TC60		704A	725P			381		D			
35	3014		TC60		706A	655P			382		E			
34	1417		TC60		707A	836P			383		F			
33	611		ET40		708A	1235X			379		D			
32	2215		ET40		710A	646P			384		E			
31	516		TC60		717A	1053P			385		G			
30	2216		ET40		718A	1223X			386		F			
29	3309		ET40		725A	754P			387		G			
28	3308		ET40		735A	703P			388		H			
27	3026		TC60		739A	759P			390		H			
26	2217		ET40		740A	1023A			501		I			
25	612		ET40		748A	949P			389		J			
24	1418		TC60		803A	929P			391		I			
23	3015		TC60		842A	719P			392		J			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____ (DAY / DATE)

DIVISION: POTRERO

SERVICE : WEEKDAY

COACH ASSIGNMENT, OPERATOR REPORT AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PAN DTS O	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
22	3016		TC60		859A	736P			393		A			
21	3017		TC60		907A	741P			394		B			
20	3018		TC60		934A	804P			395		C			
19	3019		TC60		939A	644P			396		D			
18	1431		TC60		139P	240X			375		E			
17	2252		ET40		158P	656P			386		B			
16	551		TC60		157P	743P			398		F			
15	1432		TC60		225P	1231X			373		G			
14	2253		ET40		235P	730P			371		B			
13	552		TC60		249P	837P			364		H			
12	1433		TC60		251P	750P			399		I			
11	553		TC60		328P	720P			389		J			
10	554		TC60		348P	810P			397		A			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____ (DAY / DATE)

DIVISION: POTRERO

SERVICE : WEEKDAY

COACH ASSIGNMENT, OPERATOR REPORT AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PAN DTSO	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
9	2291		ET40		858P	506X			486		C			
8	591		ET40		904P	527X			487		D			
7	1491		ET40		910P	608X			488		E			
6	2292		ET40		913P	536X			489		F			
5	1492		ET40		921P	554X			490		G			
4	592		ET40		924P	557X			491		H			
3	1494		ET40		949P	524X			492		I			
2	1493		ET40		950P	538X			493		J			
1	2293		ET40		1013P	606X			494		A			

PULL OUT FROM PRE

SIGNUP : 2018 SPRING

EFFECTIVE: 02-24-2018 FOR _____ _____ 20____
DAY DATE

DIVISION: POT/PRE

SERVICE : WEEKDAY

COACH ASSIGNMENT, OPERATOR REPORT
AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PANDS NOT	PULL OUT	PULL IN	CAR COACH	TBR EAC TKH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
14	3001		ET40		408A	747P			302		A			
13	3002		ET40		418A	111X			303		B			
12	3003		ET40		425A	131X			305		C			
11	3004		ET40		434A	151X			307		D			
10	3005		ET40		444A	929P			312		E			
9	3006		ET40		454A	211X			316		F			
8	3007		ET40		502A	730P			320		G			
7	3008		ET40		510A	1009P			325		H			
6	3010		ET40		551A	855P			349		I			
5	3011		ET40		600A	713P			353		J			
4	3013		ET40		635A	116X			371		A			

PULL OUT FROM PRE

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POT/PRE

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : WEEKDAY AND COACH MILEAGE RECORD PAGE 9 OF 10

COUNT	TRAIN	HOLD	TYPE	PAN DS	NOT	PULL OUT	PULL IN	CAR COACH	TBR ACK	BEA RTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
3	2251		ET40			156P	1000P				444		B			
2	651		ET40			226P	717P				394		C			
1	652		ET40			343P	821P				411		D			

SEE PAGE 7 FOR 30 LINE THAT NEED TO PULL OUT FROM PRESIDIO

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____ (DAY / DATE)

DIVISION: POTRERO

SERVICE : SATURDAY

COACH ASSIGNMENT, OPERATOR REPORT AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PAND OS	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
81	501		TC60		418A	108X			311		K			
80	502		TC60		438A	822P			314		L			
79	1401		TC60		442A	1014P			313		M			
78	3001		ET40		447A	754P			312		K			
77	2201		ET40		454A	1031P			315		L			
76	503		TC60		457A	922P			325		N			
75	504		TC60		458A	1031P			316		O			
74	1402		TC60		459A	115X			326		P			
73	1403		TC60		507A	601P			323		Q			
72	601		ET40		507A	1242X			317		M			
71	2202		ET40		514A	725P			322		N			
70	3301		ET40		516A	1111P			329		O			
69	505		TC60		516A	1046P			353		R			

SIGNUP : 2018 SPRING

EFFECTIVE: 02-24-2018 FOR _____ _____ 20____
DAY DATE

DIVISION: POTRERO

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : SATURDAY AND COACH MILEAGE RECORD PAGE 2 OF 7

COUNT	TRAIN	HOLD	TYPE	PAN DTS O	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
68	1405		TC60		521A	1022P			332		K			
67	1404		TC60		523A	1242X			335		L			
66	602		ET40		525A	134X			328		P			
65	2203		ET40		534A	923P			336		Q			
64	1406		TC60		537A	946P			337		M			
63	603		ET40		545A	716P			333		R			
62	3302		ET40		546A	853P			339		K			
61	3303		ET40		546A	148X			341		L			
60	2204		ET40		551A	116X			343		M			
59	1407		TC60		601A	807P			346		N			
58	1408		TC60		601A	706P			347		O			
57	604		ET40		604A	137X			342		N			
56	2205		ET40		606A	823P			350		O			
55	506		TC60		612A	123X			354		P			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POTRERO

SERVICE : SATURDAY

COACH ASSIGNMENT, OPERATOR REPORT
AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PANDTOS	PULL OUT	PULL IN	CAR COACH	TBEARCTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
54	1409		TC60		620A	202X			351		Q			
53	605		ET40		624A	1257X			352		P			
52	507		TC60		634A	714P			359		R			
51	2206		ET40		635A	658P			360		Q			
50	508		TC60		655A	1103P			344		K			
49	1410		TC60		658A	1122P			361		L			
48	607		ET40		707A	117X			357		R			
47	510		TC60		713A	804P			363		M			
46	2207		ET40		716A	757P			368		K			
45	606		ET40		726A	949P			367		L			
44	1411		TC60		729A	732P			370		N			
43	3008		ET40		730A	941P			369		M			
42	509		TC60		733A	1022P			375		O			
41	511		TC60		738A	135X			373		P			

SIGNUP : 2018 SPRING

EFFECTIVE: 02-24-2018 FOR _____ _____ 20____
DAY DATE

DIVISION: POTRERO

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : SATURDAY AND COACH MILEAGE RECORD PAGE 4 OF 7

COUNT	TRAIN	HOLD	TYPE	PAN DTS O	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
40	3304		ET40		744A	1255X			371		N			
39	2208		ET40		751A	1023P			372		O			
38	3013		TC60		818A	700P			382		Q			
37	3010		ET40		819A	710P			384		P			
36	608		ET40		819A	729P			381		Q			
35	2209		ET40		823A	908P			380		R			
34	1412		TC60		825A	937P			391		R			
33	3015		TC60		832A	708P			394		K			
32	3017		TC60		841A	717P			395		L			
31	512		TC60		841A	734P			392		M			
30	3019		TC60		847A	734P			396		N			
29	3014		TC60		853A	615P			397		O			
28	2210		ET40		854A	1133P			399		K			
27	3016		TC60		903A	624P			398		P			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POTRERO

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : SATURDAY AND COACH MILEAGE RECORD PAGE 5 OF 7

COUNT	TRAIN	HOLD	TYPE	PANDTSO	PULL OUT	PULL IN	CAR COACH	TBREARCTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
26	3018		TC60		913A	633P			400		Q			
25	3020		TC60		923A	642P			403		R			
24	2211		ET40		924A	611P			406		L			
23	1413		TC60		927A	227X			376		K			
22	3305		ET40		927A	1013P			407		M			
21	3021		TC60		933A	651P			408		L			
20	609		ET40		937A	750P			405		N			
19	3306		ET40		943A	121X			404		O			
18	610		ET40		950A	749P			411		P			
17	513		TC60		953A	853P			414		M			
16	1414		TC60		955A	150X			410		N			
15	1415		TC60		1003A	255X			416		O			
14	3022		TC60		1006A	725P			420		P			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POTRERO

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : SATURDAY AND COACH MILEAGE RECORD PAGE 6 OF 7

COUNT	TRAIN	HOLD	TYPE	PAN DTS O	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
13	2212		ET40		1013A	1227X			417		Q			
12	3307		ET40		1023A	119X			422		R			
11	3023		ET40		1111A	152X			361		K			
10	2213		ET40		1131A	1159P			347		L			
9	1491		ET40		839P	539X			488		M			
8	2291		ET40		859P	507X			486		N			
7	591		ET40		901P	534X			487		O			
6	1492		ET40		907P	527X			490		P			
5	2292		ET40		914P	537X			489		Q			
4	1493		ET40		915P	609X			492		R			
3	592		ET40		921P	604X			491		K			
2	1494		ET40		943P	557X			493		L			
1	2293		ET40		1014P	607X			494		M			

30 LINE THAT NEED TO PULL OUT FROM PRESIDIO

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POT/PRE

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : SATURDAY AND COACH MILEAGE RECORD PAGE 7 OF 7

COUNT	TRAIN	HOLD	TYPE	PAND S	NTO	PULL OUT	PULL IN	CAR COACH	TBR ACK	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
9	3002		ET40			504A	617P			320		K			
8	3003		ET40			524A	1049P			334		L			
7	3004		ET40			541A	904P			348		M			
6	3005		ET40			630A	915P			356		N			
5	3006		ET40			705A	728P			364		O			
4	3007		ET40			715A	132X			365		P			
3	3009		ET40			749A	212X			378		Q			
2	3011		ET40			840A	113X			393		R			
1	3012		ET40			921A	811P			402		K			

SEE PAGE 7 FOR 30 LINE THAT NEED TO PULL OUT FROM PRESIDIO

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____ (DAY / DATE)

DIVISION: POTRERO

SERVICE : SUNDAY

COACH ASSIGNMENT, OPERATOR REPORT AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PAN DTS O	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
81	501		TC60		418A	108X			311		S			
80	502		TC60		438A	822P			314		T			
79	1401		TC60		442A	1014P			313		U			
78	3001		ET40		447A	754P			312		S			
77	2201		ET40		454A	1031P			315		T			
76	503		TC60		457A	922P			325		V			
75	504		TC60		458A	1031P			316		W			
74	1402		TC60		459A	115X			326		X			
73	1403		TC60		507A	601P			323		Y			
72	601		ET40		507A	1242X			317		U			
71	2202		ET40		514A	725P			322		V			
70	3301		ET40		516A	1111P			329		W			
69	505		TC60		516A	1046P			353		Z			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POTRERO

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : SUNDAY AND COACH MILEAGE RECORD PAGE 2 OF 7

COUNT	TRAIN	HOLD	TYPE	PANDOS	PULL OUT	PULL IN	CAR COACH	TRACK BREAK	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
68	1405		TC60		521A	1022P			332		S			
67	1404		TC60		523A	1242X			335		T			
66	602		ET40		525A	134X			328		X			
65	2203		ET40		534A	923P			336		Y			
64	1406		TC60		537A	946P			337		U			
63	603		ET40		545A	716P			333		Z			
62	3302		ET40		546A	853P			339		S			
61	3303		ET40		546A	148X			341		T			
60	2204		ET40		551A	116X			343		U			
59	1407		TC60		601A	807P			346		V			
58	1408		TC60		601A	706P			347		W			
57	604		ET40		604A	137X			342		V			
56	2205		ET40		606A	823P			350		W			
55	506		TC60		612A	123X			354		X			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____ (DAY / DATE)

DIVISION: POTRERO

SERVICE : SUNDAY

COACH ASSIGNMENT, OPERATOR REPORT AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PAN DTOS	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
54	1409		TC60		620A	202X			351		Y			
53	605		ET40		624A	1257X			352		X			
52	507		TC60		634A	714P			359		Z			
51	2206		ET40		635A	658P			360		Y			
50	508		TC60		655A	1103P			344		S			
49	1410		TC60		658A	1122P			361		T			
48	607		ET40		707A	117X			357		Z			
47	510		TC60		713A	804P			363		U			
46	2207		ET40		716A	757P			368		S			
45	606		ET40		726A	949P			367		T			
44	1411		TC60		729A	732P			370		V			
43	3008		ET40		730A	941P			369		U			
42	509		TC60		733A	1022P			375		W			
41	511		TC60		738A	135X			373		X			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____ (DAY / DATE)

DIVISION: POTRERO

SERVICE : SUNDAY

COACH ASSIGNMENT, OPERATOR REPORT AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PAN DTS O	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
40	3304		ET40		744A	1255X			371		V			
39	2208		ET40		751A	1023P			372		W			
38	3013		TC60		818A	700P			382		Y			
37	3010		ET40		819A	710P			384		X			
36	608		ET40		819A	729P			381		Y			
35	2209		ET40		823A	908P			380		Z			
34	1412		TC60		825A	937P			391		Z			
33	3015		TC60		832A	708P			394		S			
32	3017		TC60		841A	717P			395		T			
31	512		TC60		841A	734P			392		U			
30	3019		TC60		847A	734P			396		V			
29	3014		TC60		853A	615P			397		W			
28	2210		ET40		854A	1133P			399		S			
27	3016		TC60		903A	624P			398		X			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____ (DAY / DATE)

DIVISION: POTRERO

SERVICE : SUNDAY

COACH ASSIGNMENT, OPERATOR REPORT AND COACH MILEAGE RECORD

COUNT	TRAIN	HOLD	TYPE	PAN DTOS	PULL OUT	PULL IN	CAR COACH	TBR EAR CTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
26	3018		TC60		913A	633P			400		Y			
25	3020		TC60		923A	642P			403		Z			
24	2211		ET40		924A	611P			406		T			
23	1413		TC60		927A	227X			376		S			
22	3305		ET40		927A	1013P			407		U			
21	3021		TC60		933A	651P			408		T			
20	609		ET40		937A	750P			405		V			
19	3306		ET40		943A	121X			404		W			
18	610		ET40		950A	749P			411		X			
17	513		TC60		953A	853P			414		U			
16	1414		TC60		955A	150X			410		V			
15	1415		TC60		1003A	255X			416		W			
14	3022		TC60		1006A	725P			420		X			

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POTRERO

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : SUNDAY AND COACH MILEAGE RECORD PAGE 6 OF 7

COUNT	TRAIN	HOLD	TYPE	PANDTOS	PULL OUT	PULL IN	CAR COACH	TBREARCTH	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
13	2212		ET40		1013A	1227X			417		Y			
12	3307		ET40		1023A	119X			422		Z			
11	3023		ET40		1111A	152X			361		S			
10	2213		ET40		1131A	1159P			347		T			
9	1491		ET40		839P	539X			488		U			
8	2291		ET40		859P	507X			486		V			
7	591		ET40		901P	534X			487		W			
6	1492		ET40		907P	527X			490		X			
5	2292		ET40		914P	537X			489		Y			
4	1493		ET40		915P	609X			492		Z			
3	592		ET40		921P	604X			491		S			
2	1494		ET40		943P	557X			493		T			
1	2293		ET40		1014P	607X			494		U			

30 LINE THAT NEED TO PULL OUT FROM PRESIDIO

SIGNUP : 2018 SPRING | EFFECTIVE: 02-24-2018 | FOR _____ _____ 20____
DAY DATE

DIVISION: POT/PRE

COACH ASSIGNMENT, OPERATOR REPORT
SERVICE : SUNDAY AND COACH MILEAGE RECORD PAGE 7 OF 7

COUNT	TRAIN	HOLD	TYPE	PANDTOS	PULL OUT	PULL IN	CAR COACH	TBRACKT	RUN NUM	OPERATOR REPORT	CODE ACS	VEH MILE EXCP	LPO	EPI
9	3002		ET40		504A	617P			320		S			
8	3003		ET40		524A	1049P			334		T			
7	3004		ET40		541A	904P			348		U			
6	3005		ET40		630A	915P			356		V			
5	3006		ET40		705A	728P			364		W			
4	3007		ET40		715A	132X			365		X			
3	3009		ET40		749A	212X			378		Y			
2	3011		ET40		840A	113X			393		Z			
1	3012		ET40		921A	811P			402		S			

APPENDIX F:
SECURITY SENSITIVE INFORMATION PROCESS REGARDING TRACTION POWER STANDARD SPECIFICATIONS

SFMTA POTRERO YARD MODERNIZATION PROJECT

SENSITIVE SECURITY INFORMATION CONFIDENTIALITY AND NONDISCLOSURE AGREEMENT

RECITALS

A. On November 2, 2022, the City and County of San Francisco, through its Municipal Transportation Agency (SFMTA), and Potrero Neighborhood Collective LLC, a limited liability company organized under the laws of the State of Delaware (Lead Developer) entered into an agreement for predevelopment services (Predevelopment Agreement) for the SFMTA Potrero Yard Modernization Project (Project).

B. The Project is a joint development project that includes the design, construction, financing, operation, and maintenance of an infrastructure facility to be comprised of at a transit facility for the SFMTA's fleet of electric trolley buses (Bus Yard Component) and common infrastructure to be shared by the Bus Yard Component and a housing and commercial component or other use.

C. The SFMTA wishes to share with Lead Developer certain drawings and specifications related to the SFMTA's traction power system and related design elements, which are marked as "Sensitive Security Information" or "SSI Documents" are confidential and protected from public disclosure under federal law. See 49 CFR Parts 15 and 1520; Lead Developer requires these SSI Documents for design work on the Project's Bus Yard Component.

D. The disclosure of SSI Documents to unauthorized persons is a violation of federal law, may cause irreparable damage to the SFMTA, and may threaten or compromise the security of the traveling public, transit employees, or transit infrastructure.

E. SFMTA will make available SSI Documents in connection with the Project to Lead Developer (SSI Recipient), subject to the following terms and conditions.

AGREEMENT

1. Acknowledgment. By signing this Agreement, SSI Recipient acknowledges that the disclosure to the public of any documents denoted as SSI would cause security risks that may cause irreparable damage to the SFMTA, and may threaten or compromise the security of the traveling public, transit employees, or transit infrastructure. The SFMTA will make the following SSI Documents available to the SSI Recipient:

1. Sample construction specification 16121 – Traction Power Cable, August 2023
2. Sample construction specification 16180 – DC Trolley Switch and Catenary Detection, August 2023
3. Sample construction specification 16312 – Traction Power Substation, August 2023
4. Sample construction specification 16790 – Traction Power SCADA System, August 2023
5. Central Subway Chinatown Station Drawings, dual feed traction power substation, 2012
6. King Substation Upgrade Drawings, single feed traction power substation, 2017
7. King Substation Upgrade construction specifications, traction power substation upgrade, 2017
8. King Substation Upgrade, surge arrest final design, 2022

2. **Agreements**. By signing this Agreement, SSI Recipient agrees to the following:

2.1. **Non-Disclosure of SSI Documents**. SSI Recipient shall not disclose to any person or firm any SSI Document without the prior express written consent of the SFMTA, which consent shall be by Kerstin Magary, Section Director, CSO Facilities and Real Property Manager or her designee, and without such person or firm executing a Confidentiality and Nondisclosure Agreement attached as Exhibit A to this Agreement.

2.2. **Use of SSI Documents**. SSI Recipient shall use SSI Documents provided by the SFMTA only for the following purpose: to assess whether they are applicable to be incorporated into the Project's bus yard infrastructure, and if so, to then incorporate them into the design of the Bus Yard Component.

2.3. **Reproduction and Cover/Removal of Markings Prohibited**. SSI Recipient shall not copy or otherwise reproduce SSI Documents without express written authorization from the SFMTA. SSI Recipient shall not cover, remove or otherwise hide from display markings identifying SSI Documents as Sensitive Security Information.

2.4. **Safeguards Against Unauthorized Disclosure of SSI.** With respect to SSI, SSI Recipient shall implement the following safeguards and procedures to prevent the unauthorized disclosure of SSI. SSI Recipient shall designate a responsible managing employee or responsible managing officer as its Sensitive Security Information Handler (SSIH), who shall ensure that all safeguards are maintained, including the following:

(a) Ensuring that the SSI Documents are properly marked as required under federal law.

(b) Providing authorized employees and consultants adequate instructions with regard to the use and disclosure of SSI, including obtaining the employees' signed Confidentiality and Nondisclosure Agreement forms (Exhibit A).

(c) Implementing safeguards to restrict copies and reproductions of SSI in any form, including, but not limited to, paper copies and electronically formatted copies. SSI Recipient's SSIH shall authorize copies of portions of SSI only on a need-to-know basis, as determined by SFMTA, and shall retrieve all such copies upon completion of the task for which they were required. Copies and reproductions of SSI shall not be made for or retained for distribution to any third party unless the third party has complied with the requirements of Section 2.1. SSI Recipient shall identify each copy of SSI released by copy number and maintain a record of all copies of SSI released to employees and third parties on the Log of Copies of SSI provided as Exhibit B.

3. **SSI Documents Taken Off SFMTA Premises**. If the SFMTA provides SSI Recipient copies of SSI Documents and allows said documents to be removed from SFMTA premises, the SSI Recipient shall maintain said documents in a secure location and shall use them only for the purposes described in this Agreement. Upon request of the SFMTA, SSI Recipient shall certify that all SSI Documents have been returned to the SFMTA or destroyed by shredding.

4. **Unauthorized Disclosure or Loss of SSI Documents**. SSI Recipient agrees that if at any time he/she misplaces or loses control over SSI Documents in his/her custody or inadvertently provides access to persons or parties not authorized by the SFMTA to receive SSI Documents, the SSI Recipient shall notify the SFMTA immediately (i.e., no later than 24 hours) upon discovery that an unauthorized disclosure or loss of control of SSI Documents has occurred. Such notice shall be given orally and in writing, and shall provide all details that are available regarding the event. The oral notices shall be given by telephone to

Kerstin Magary at (415) 608-3004. The written notices shall be mailed to Kerstin Magary at the SFMTA address listed in paragraph 10, below. The SFMTA will investigate the facts underlying SSI Recipient's disclosure or loss of control over SSI Documents. In the event that the SFMTA determines that such unauthorized disclosure or loss of control constituted an unauthorized disclosure or improper use of SSI Documents by SSI Recipient, the SFMTA may pursue remedies as set forth in Section 6.

5. **Ownership of Sensitive Security Information**. Recipient agrees that all SSI Documents provided to the SSI Recipient will at all times remain the property of the SFMTA, which retains all rights to them.

6. **SFMTA Remedies**. SSI Recipient acknowledges that the unauthorized disclosure or improper use of SSI Documents by Recipient may cause irreparable harm to the SFMTA and the public. The SFMTA retains all of its legal rights and remedies to enforce this Agreement. Furthermore, SSI Recipient acknowledges that the SFMTA is entitled to seek equitable remedies, including temporary and permanent injunctive relief, without the necessity of posting a bond or other security, to enforce this Agreement. No remedy or election under this Agreement shall be deemed exclusive but shall, whenever possible, be cumulative with all other remedies at law or in equity.

7. **Attorneys' Fees**. In the event that a suit or other legal action is necessary to enforce any of the provisions herein contained, the prevailing party shall be entitled to reasonable attorneys' fees in addition to costs.

8. **Assignment**. SSI Recipient shall not assign any rights or transfer any obligation under this Agreement without the express written consent of the SFMTA.

9. **Severability**. Should the application of any provision of this Agreement to any particular facts or circumstances be found by a court of competent jurisdiction to be invalid or unenforceable, then (a) the validity of other provisions of this Agreement shall not be affected or impaired thereby, and (b) such provision shall be enforced to the maximum extent possible so as to effect the intent of the parties and shall be reformed without further action by the parties to the extent necessary to make such provision valid and enforceable..

10. **Notices**. All written communications sent by the parties may be by U.S. mail, e-mail or by fax, and shall be addressed as follows:

To SFMTA:

Kerstin Magary
Section Director, CSO Facilities and Real Property Management
1 South Van Ness Ave., 8th Floor, #8191
San Francisco, CA 94103
Kerstin.Magary @sfmta.com

To SSI Recipient:

Name:
Address:
Phone:
Email:

Any notice of default must be sent by registered mail or by personal service.

11. **Applicable Law**. This Agreement shall be governed by, and construed and interpreted in accordance with the laws of California. Venue for any action arising from this Agreement or related thereto shall be in courts located in San Francisco, California.

12. Successors. This Agreement shall be binding on and inure to the benefit of SSI Recipient's successors or assigns.

IN WITNESS WHEREOF, the SSI Recipient has caused this Agreement to be duly executed in San Francisco, California.

Dated: _____

SSI Recipient:

_____
Signature
Name (please print)

_____

Title:

_____
Name, business address, and phone number of SSI Recipient:

_____

_____

_____

EXHIBIT A

NON-DISCLOSURE CONSENT FORM
to be executed by Employees of SSI Recipient or Third Party

Firm Name: _____

Employee Name: _____

Employee Address: _____

I agree that any disclosure to me of information designated as Sensitive Security Information pertaining to the San Francisco Municipal Transportation Agency (SFMTA) SFMTA Potrero Yard Modernization Project (the Project), will be subject to the following obligations:

1. I have received, read, and understand: (1) FTA Resource Document for Transit Agencies – SSI Designation, Markings, and Control; and (2) TSA Sensitive Security Information Best Practices Guide for Non-DHS Employees and Contractors.

2. I confirm that I have been provided a copy of the Confidentiality Agreement between the SFMTA and SSI Recipient. I confirm that I will comply at all times with the SSI Recipient's obligations in relation to the SSI Documents as set out in the Confidentiality Agreement, and will not do anything that would or could jeopardize any of the SSI Recipient's obligations in relation to the SSI Documents, or lead to a breach or compromise of the security of the SSI Documents.

3. I will not disclose or permit disclosure of the SSI Documents, or permit anyone to use the SSI Documents, without the prior written approval of the SSI Recipient's Sensitive Security Information Handler and the SFMTA.

4. The above obligations of confidentiality and non-use will apply to my work on the Project, and will continue to apply without limitation of time after the date of termination of my work.

Executed by:

_____	_____
Employee Signature	**SSI Handler**
_____	_____
Date	**Date**

EXHIBIT B

LOG OF COPIES OF CONFIDENTIAL INFORMATION

SSI Recipient: _____

SSI Recipient: SSI Handler (SSIH): _____

Copy Number	Date Copy Made	Description	Employee or Third Party in Receipt of Copy	Date Copy Returned to SSIH

APPENDIX G:
DESIGN CRITERIA PARATRANSIT
(FOR REFERENCE)

SPACE NEEDS PROGRAM

1.0 Introduction

This section presents the Space Needs Program for the SFMTA Paratransit. The Space Needs Program illustrates the space requirements for efficient operations. The program is summarized at the end of this section, which includes projected square footage needs for building areas and exterior areas. These projected space needs are subtotaled to include site access, landscaping, and setbacks for total site acreage requirements.

1.1 Staff Summary

Facility staffing levels are crucial to planning efforts when determining the number of parking spaces, size of support facilities, and developing occupancy levels. Table 1.A is the summary of facility staffing levels for each scenario.

1.2 Vehicle Parking Summary

The following Table 1.B is the summary of vehicles for each scenario.

TABLE 1.A - PARATRANSIT - STAFF SUMMARY

	Scenario 1A New Facility
Function	Staff
Maintenance	23
Operations	27
TOTAL	50

TABLE 1.B - PARATRANSIT- VEHICLE SUMMARY

	Scenario 1A New Facility
Function	Number of Spaces
Cutaway Buses	150
Vans	10
TOTAL	160

SPACE NEEDS PROGRAM

1.3 Rule of Thumb Planning Ratio

The table lists the key planning ratios. Information taken from *2017 SFMTA Facilities Framework Addendum*, published October 2017.

TABLE 1.C

SPACE	RATIO OR SPACE STANDARDS
Maintenance Repair Bay (20' x 40')	1 bay for every 20 buses to be maintained
Chassis Wash Bay (25' x 40')	1 bay for every 150-200 buses to be maintained
Brake Shop	5 SF per bus
Tire Storage	5 SF per bus for 1 tire per bus
Parts Storage	20 SF per bus with High Density Storage System
*SQUARE FEET (SF)	

SPACE NEEDS PROGRAM

1.4 Space Standards

Space standards were applied to the Space Needs Program and generally apply to the Offices, Shops, Bays, and Vehicle Parking Areas. Area requirements in Shops and Storage Areas were derived from functional requirements and equipment space needs. The space standards listed below were utilized to develop the facility program and overall area requirements. The space standards are based on functional needs and requirements established through the design of other facilities, rules of thumb, and specific requirements of each functional group.

TABLE 1.D

AREA	SIZE
SHOP:	
Common Work Area	300 SF
Portable Equipment Storage	200 SF
Lube Room	200-300 SF
Compressor Room	200 SF
PARKING:	
Cutaway Buses	324 SF (12 x 27)
Vans	200 SF (10 x 20)
Large Non- Revenue Vehicles	420 SF (12 x 35)
Standard Non-Revenue Vehicles	200 SF (10 x 20)
CIRCULATION:	
Aisles for 90 degree turns	40' turning into parking lanes or service
Aisles for 90 degree turns	50' turning into maintenance bays
Forklift Circulation	10' wide

*SQUARE FEET (SF)

SPACE NEEDS PROGRAM

1.5 Circulation Factors

The space requirements shown for each function are net usable area. By using the urban design approach to this development of the facility, the Project Team hopes to minimize the amount of circulation necessary for an efficient facility. Interior or Building Circulation is the only applicable circulation factor for the SFMTA facilities.

1.6 Interior or Building Circulation

This factor is applied to the program as a percentage of the total building square footage. It accounts for miscellaneous building spaces such as hallways, stairwells, custodial closets, mechanical, plumbing, and electrical rooms, wall thickness, structure (Circ/Mech/Elec/Struct - Net:Gross), and access requirements. The following is a list of the factors (in general) that have been applied to the program:

- Bays, Shops, & Parts 40%
- Maintenance 40%
- Operations 40%

1.7 Parking Circulation

This factor is included to account for the drive aisles, walkways, islands, and other areas crated by site and access inefficiencies. This factor can vary from 15% to 100% of the actual space occupied by a vehicle. For this project the following factors were applied:

- Vehicle parking areas 75%

1.8 Space Needs Program & Summary

A summary of the Space Needs Program for each of the three scenarios is provided on the following pages. The summary tables include projected square footage needs for building areas, parking, and staff totals.

These projected space needs are subtotaled into net square footage requirements.

The detailed Space Needs Program begins with the identification of each space by name and a space standard (if applicable). The space column represents spaces required to accommodate the fleet inclusively and operation for the Final build out.

SPACE NEEDS PROGRAM

TABLE 1.E - PARATRANSIT

Function	Space Standard			Staff or Vehicles	Number of Spaces	Unit Size (sf)	Subtotal (sf)	Comments
PARKING								
Cutaway Buses	12	x	27		150	324	48,600	
Vans	10	x	20		10	200	2,000	
Assignable Area							**50,600**	
BAYS, SHOPS, & PARTS								
Maintenance Bays	20	x	40		8	800	6,400	
Chassis Wash Bay	85	x	40		1	3400	3,400	
Parts Room					1	600	600	
Tire & Brake Shop					1	800	800	
Lube & Compressor Room					1	500	500	
CWA					1	300	300	
PES					1	200	200	
Assignable Area							**12,000**	
Subtotal (Add 20%)							**14,400**	
MAINTENANCE								
Men's Locker			7	18	18	7	126	
Men's Restroom					1	200	200	
Women's Locker			7	5	5	7	35	
Women's Restroom					1	150	150	
Gender Neutral Locker/Restroom					1	150	150	
Assignable Area							661	
Subtotal (Add 40%)							**925**	

SPACE NEEDS PROGRAM

Function	Space Standard			Staff or Vehicles	Number of Spaces	Unit Size (sf)	Subtotal (sf)	Comments
OPERATIONS								
Lobby					1	120	120	
General Manager			224	1	1	224	224	Private Office
Assistant General Manager			120	1	1	120	120	Private Office
HR Manager			120	1	1	120	120	Private Office
Administrative Assistant			48	1	1	48	48	Workstation
Safety Manager			120	1	1	120	120	Private Office
FTA or SFMTA Monitor				2	1	120	120	Shared Office
Counting and Payroll				2	1	120	120	Shared Office
Group Van Dispatch				1	1	64	64	Workstation
Scheduling, Group Van, Admin				8	8	64	512	Workstation
Field Supervisors			64	6	2	64	128	Workstation
Trainers			64	1	1	64	64	Workstation
Dispatch Supervisor			120	1	1	120	120	Private Office
Dispatch			64	1	8	64	512	Workstation
Call Center			36	1	8	36	288	Workstation
Dispatch Window					1	224	224	
Copy/Supply					1	120	120	
Mail Box Alcove					1	20	20	
Dispatch /Call Center Locker Alcove					1	24	24	
Office Coffee Alcove					1	30	30	
Conference Room					1	240	240	
Training Room					1	680	680	

SPACE NEEDS PROGRAM

Function	Space Standard			Staff or Vehicles	Number of Spaces	Unit Size (sf)	Subtotal (sf)	Comments
Driver Ready Room					1	500	500	
Kitchenette					1	120	120	
Driver Men's Locker			3		100	3	300	
Driver Women's Locker			3		100	3	300	
Lactation Room					1	80	80	
Men's Restroom					1	250	250	
Women's Restroom					1	250	250	
Gender Neutral Locker/Shower/Restroom					1	60	60	
Mechanical					1	500	500	
Electrical					1	500	500	
Data/Comm Room					1	100	100	
Custodial					1	100	100	
Assignable Area							7,078	
Subtotal (Add 40%)							**9,909**	
VEHICLE CIRCULATION (will vary depending on site configuration, number of levels, and number of ramps required)								
Parking Circulation (75%)							37,950	
Bay Circulation					8	700	5,600	
Vehicle Circulation							**43,550**	
PARATRANSIT SUBTOTAL							**75,800**	

DESIGN CRITERIA NARRATIVE

2.1 Purpose & Intent

The purpose of this section is to define goals that were developed throughout the SFMTA Planning Study. Guided by planning, compliance, and general site criteria, simple narratives are included to provide an overview of specific systems and assemblies that the facilities will require. The intent of these narratives is to present SFMTA and client representatives an easy to understand, non-technical explanation of how this facility is proposed to function, and includes considerations from employee and stakeholder input during the Design Charrette (January/February 2018).

2.2 Planning Criteria

The following, Table 4.2, is a general description of the planning objectives, building quality, and transit specialty needs for paratransit facilities.

TABLE 2.A - PLANNING CRITERIA	
Design Life	75 years
Quality	The planning, design, and construction of the facility shall be high quality and long-lasting, have the necessary spaces and systems to function well, provide a safe and healthy work environment, and be economical and resource efficient to operate and to maintain.
Planning	The facility layout shall have a logical and efficient organization and flow to allow easy and safe access and circulation for staff, vehicles, and service providers. The layout shall be open and modular with the structure located to support building and equipment loads.
Flexibility	The facility shall be designed to be flexible. Vehicle parking, service, and maintenance spaces shall have an open and modular layout to accommodate paratransit vehicles. Staff areas shall be designed with an open plan with modular partitions and furnishings that can accommodate staffing and programming needs over time.
Space Utilization	The facility shall include all required spaces and assignable square footages (area inside room or boundary) in Section Two of the Facility Program as well as minimum dimensions and clearances as defined in the Space Standards. Vehicle areas shall be planned to maximize fleet capacity, sharing where possible circulation between functions such as parking and maintenance bays.
Workspace	Workspaces shall be designed based on needs to be highly functional spaces with quality environments that support staff health, safety, and productivity with good lighting, good ventilation, and durable finishes.
Safety	The facility shall have the best practice safety features including fire life safety systems; adequate means of egress and wayfinding components to exit discharge; fall protection; eye and ear protection; unobstructed circulation and equipment clear space; easy to use fluids collection; and good ventilation with positive pressure in staff areas
Security	The facility shall have passive and active security. The site shall have limited vehicular and pedestrian entries that are easy to find and visible. The facility shall have card readers at all exterior entries, suite entries, and support spaces. Security camera system shall be installed to monitor all exterior access and interior areas.

DESIGN CRITERIA NARRATIVE

2.3 Compliance

The Paratransit Facility shall comply with all applicable governing codes and ordinances that regulate building construction, site design, life safety, fire protection, accessibility, energy, and environmental requirements as follows (or those which are applicable at the time the design is initiated):

TABLE 2.B - BUILDING CODE & ZONING REQUIREMENTS

Authority Having Jurisdiction:	City and County of San Francisco
Zoning Code:	San Francisco Municipal Code
Applicable Codes (Adopted):	2016 California Building Standards Code (2016 International Code Council) California Residential Code (2015 International Residential Code) California Electrical Code (2014 National Electrical Code) California Mechanical Code (2015 Uniform Mechanical Code) California Plumbing Code (2015 Uniform Plumbing Code) California Existing Building Code (2015 International Existing Building Code) California Energy Code California Historical Building Code California Fire Code California Green Building Standards Code California Reference Standards Code 2016 San Francisco Code Amendments, State Amendments, Ordinances, and Law
OCCUPANCY GROUP	S-2, B, R-2

CONSTRUCTION TYPE/ HEIGHT & AREA (ICC TABLE 504.3) SEE ALSO ICC TABLE 503	
Type I-B Max.	150'-0"/ _Floors @_SF ea. Per ICC 2016; 85' per San Francisco Municipal Code
FIRE PROTECTION:	Sprinkler System
(PLANNED) ZONING/ F.A.R.	UMU (Urban Mixed-Use)/ 6.0 to 1 (currently zoned as Public)

AREA CALCULATIONS (IF @144'-0" TO PARAPET)

Space	Occupancy Group	Existing	Demo	Renovation	
Garage, Training/ Operations	S-2, B				
Joint Development	R-2				
TOTALS					

FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS, FOR TYPE 1-B CONSTRUCTION (ICC TABLE 601)	
Structural Frame Including Columns, Joists, & Girders	Supporting Floors - 2 hours

DESIGN CRITERIA NARRATIVE

TABLE 2.B (CONT.) - BUILDING CODE & ZONING REQUIREMENTS

	Supporting Roof ONLY - 1 hour
Bearing Walls Exterior	(per ICC Table 602) - 2 hours
Bearing Walls Interior	Supporting Floors - 2 hours
	Supporting Roof ONLY - 1 hour
Non-Bearing Walls & Partitions Exterior	(per ICC Table 602) - 1 hour
Floor Construction Including Supporting Beams & Joists	2 hours
Roof Construction Including Supporting Beams & Joists	2 hours

OCCUPANCY SEPARATION, FIRE BARRIERS, FIRE PARTITIONS, & REQUIRED OPENING PROTECTIVES, FOR TYPE I-B CONSTRUCTION (ICC TABLE 504.3, TABLE 504.4, TABLE 716.5)

	PARTITIONS	OPENINGS
Occupancy Separation between (S-2, Bus Repair Garage) & (B, Training Area, Operations)	2 hours	
Occupancy Separation between (S-2, Bus Repair Garage) & (R-2, Residential T.O.D.)	2 hours	
Exit Passageways	1 hour	1 hour
Exit Enclosures	1 hour	1 hour
Vertical Shafts (for 14 stories, 144'-0" total height)	1 hour	1 hour

INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY (SPRINKLERED BUILDING), FOR TYPE I-B CONSTRUCTION (ICC TABLE 803.11)

Occupancy Group	Exist Enclosures & Exit Passageways	Corridors	Rooms & Enclosed Spaces
S-2	Class C	Class C	Class C
B	Class B	Class C	Class C
R-2	Class C	Class C	Class C

DESIGN CRITERIA NARRATIVE

2.4 General Site Requirements

There are specific site requirements necessary to ensure safe, efficient, and functional facilities. These specific requirements are outlined (and not limited to) the following:

GENERAL SITE REQUIREMENTS	
Site Accessibility	Provide a minimum of two vehicular entries/exits configured such that either could work as the entry/exit in the event that the other is unavailable
Site Lighting	Use appropriate and adequate lighting for typical operations and to ensure high level of surrounding visibility
Pedestrian Safety & Accessibility	Observe all code and regulation requirements to insure safe and defined pedestrian circulation paths (necessary striping, bollards, curb cuts, etc.); and that paths minimally intersect fleet ingress and egress
Site Stormwater Drainage	Positive drainage and appropriate stormwater discharge from site and upper exterior/open decks; a stormwater management and pollution prevention plan shall be established
Sustainability	Provide as required including CALGreen, LEED Gold requirements detailed in Chapter Seven of the Environmental Code of the City and County of San Francisco
Parking	(Employee Parking will not be provided)
Security	Provide site video surveillance and building security

DESIGN CRITERIA NARRATIVE

2.5 Architectural Narrative

The Paratransit Facility is intended to service, maintain and store a fleet of cutaway buses and vans. It consists of Bays & Shops, Maintenance, and Operations.

2.5.1 Site

The current Potrero Yard and Garage Facility, located on a city block bound by Mariposa Street to the south, 17th Street to the north, Hampshire Street to the east, and Bryant Street to the west, sits at the edge of the Mission District and Potrero Facility Hill. The site is currently zoned as P (Public), with adjacent sites having the zoning designations as PDR-1 (Production, Distribution, and Repair Businesses) and UMU (Urban Mixed Use). Through discussions with Planning, it has been agreed upon that we will use UMC (within the Eastern Neighborhoods District MUD (Mixed Use Development)).

The New Facility site, located between McKinney Avenue and Kirkwood Avenue, with Highway 280 running between the New Facility and adjacent trucking operations. The site is currently zoned as Industrial.

2.5.3 Planning/Programming

Following the release of the 2017 SFMTA Facilities Framework to address facility needs in January 2017, an Addendum was later released describing the SFMTA's pared down, refined scenarios to address its facility needs. The Framework included five scenarios, which were later narrowed to three with Paratranist included.

2.6 Structural Narrative

The Potrero and New Facility Yard Reconstruction project will require several considerations in the appropriate selection of a structural system. Given the long spans of the Bus Garage & Maintenance Facility and the load requirements for the residential development above, a post-tensioned, cast-in-place concrete beam and slab system with concrete shear walls for resisting lateral loads are appropriate.

A separate geotechnical investigation will be required depending on location. Final Design will be responsible for geotechnical analysis.

2.7 Mechanical Narrative

General HVAC:
Supply, exhaust, and return ducts shall be designed with a maximum of 0.06-inch water gauge static pressure drop per 100 feet of duct. Supply ductwork serving mechanical air conditioning will be insulated. Exposed ductwork will be round, uninsulated and suitable for painting.

Seismic-restraint systems shall comply with CBC requirements.

2.7.1 Operations Areas

The operations portion of the facility will include heating and air conditioning capabilities. Zoning will be determined by essential and non-essential personnel. No more than three offices per thermostat. Ventilation will be in accordance with ASHRAE 62.1.

Exhaust will be included for locker rooms, restrooms, kitchen/breakrooms and janitorial areas. A minimum of 0.50 to 1.0 CFM per square foot exhaust is recommended for these types of spaces.

2.7.2 Maintenance Areas

Filtered and heated ventilation supply air distribution system, plus exhaust will serve the maintenance areas.

Vehicle maintenance and enclosed parking areas will maintain 0.75 to 1.0 CFM per square foot at all times in accordance with CFC, CMC and NFPA. Enclosed parking areas will have exhaust grilles within 18-inches of finished floor every 50 feet along perimeter in accordance with CMC Article 403.7.2.3 requirements. Additional exhaust grilles within 18-inches of the ceiling structure for capture of H2 gases is also required.

DESIGN CRITERIA NARRATIVE

Upon detection of CO, NO2, and/or H2, exhaust rate will immediately increase to achieve 4 air changes per hour for 10 minutes after CO, NOx and/or H2 detection system readings return to normal levels.

Exhaust fans serving enclosed parking areas will be rated for Class 1, Div. 2 hazard classification and have control dampers. Fans shall be capable of exhausting ten air changes per hour when CO, NO2 and/or H2 levels exceed 20% LEL.

2.8 Plumbing Systems

Domestic and fire protection water will be provided to the building from a water line extended from the site service connection. A strainer, lead-free reduced pressure backflow and utility grade remote reading water meter will be provided on domestic water lines serving the building. The backflow relief will discharge outside of the building.

The building domestic water service will be a complete connection to the existing street water main. Pipe sizing inside of the building shall comply with the requirements in the CPC and a maximum system piping loss to provide a 10% pressure safety factor at full system flow. Velocities within any main or branch of the piping shall not exceed seven feet per second (FPS). Interior domestic water piping above grade will be Type L copper with copper solder- or pressure-sealed joints. All buried domestic water pipe below slab will be protected with 20 mil polyethylene tape and pipe sleeve at slab penetration.

The supply line to each item of equipment or fixture shall be equipped with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Water hammer arrestors will be in accessible location, on the domestic water piping system where shock pressures could occur. Water hammer arrestors will be PDI-WH 201 certified.

A high efficiency domestic water heating system will be provided with hot water recirculation. Per CALGreen standards, a recirculation pump with timer are required to provide sufficient hot water throughout the facility. A thermostatic mixing valve will be installed on hot water systems. Domestic hot water system to be provided with thermal expansion tank, and re-circulating pump, for hot water return system.

All hot water piping shall be insulated. High-efficiency, low-flow plumbing fixtures will be employed throughout the building to meet CALGreen's current standards. ADA-compliant electric water coolers and toilet room fixtures will be incorporated.

Water closets will be low flow, vitreous china, siphon jet, 1.28 gallon per flush (maximum); commercial seat with self-sustaining check hinge. Ultra-low flow vitreous urinals (0.125 GPF).

Lavatories will be under-counter or wall-hung mounting, with deck mounted, hydraulic powered, 0.35 GPM infrared faucets, with sensor under spout.

Floor mounted mop basin of molded stone with wall-mounted chrome-plated service sink faucet with vacuum breaker; ADA compliant handles with maximum flow rate of 2.0 GPM. Break (coffee) and kitchen area sinks will be stainless steel, with a 1.5 GPM single lever faucet and a half- horsepower garbage disposal.

A gravity sanitary lateral will handle all levels, except the basement. The basement will have a sewage ejection system consisting of a sump tank, duplex ejectorpumps and pits sized to unit pump to a maximum of six starts per hour. Ejector pumps will be connected to standby power. Sanitary waste will discharge to the street main.

All industrial waste and covered parking decks will drain to an appropriately sized oil/water interceptor prior to connecting to the municipal sanitary system.

The storm water system will consist of area drains, roof drains and over-flow drains.

2.9 Fire Protection Systems

Integrate all requirements and criteria for safety, security and reliability to design, furnish, and install a complete fire protection system. Establish the hazard and coverage requirements for fire protection systems in conjunction with the City and authority having jurisdiction (AHJ). Provide fire suppression systems in compliance with NFPA 13, 14, 30A, and 88A. The need for a fire pump will be determined by the fire suppression designer. Fire protection system will be design delegated to a licensed contractor. The system will be hydraulically calculated.

DESIGN CRITERIA NARRATIVE

Sprinkler system occupancy hazard classification, minimum density and maximum sprinkler spacing and standpipe requirements shall be determined in concert with the authority having jurisdiction (AHJ) and using NFPA 13 and 14 guidelines. Current street hydrant flow test data will need to be determined.

2.9.1 Mechanical Sustainable Design Systems

Sustainable design requirements and best practices will be complied with, adopted, and implemented where such requirements are promoted by the United States Green Building Council (USGBC), as defined under the published LEED Standards. Code required restrictions placed on the use and quantities of toxic and/or environmentally deleterious substances such as Volatile Organic Compounds, (VOCs), that are components in certain sealants and construction materials, and on the use of HCFC refrigerants in HVAC systems, are specific examples of applicability of such sustainable-based Code design requirements.

An energy model will be required based on performance approach to confirm compliance with CALGreen requirements.

Heating and cooling load calculations for the industrial areas will be performed in accordance with LEED, CALGreen, and Climate Zone 3. The design of the mechanical ventilation systems, heating systems and cooling systems will comply with the respective requirements of the CMC, ASHRAE Standards of Indoor Air Quality and Thermal Comfort, and CALGreen where applicable.

2.10 Electrical

Governing Codes, Acts, and Guidelines:
Applicable Codes and Standards include: NFPA 70 NEC, California Building Code with Local Amendments, and California Green Building Standards with Local Amendments. Seismic-restraint systems shall comply with California Building Code requirements.

The building and electrical systems shall be designed in compliance with LEED GOLD Certification.

2.10.1 Systems Overview

Basic electrical systems for the SFMTA Potrero and New Facility Yards will include powering the mechanical systems, maintenance equipment, convenience receptacle power, interior and exterior lighting systems with controls, and an addressable fire alarm system.

2.10.2 General Building Requirements

Basic Electrical Systems for the building, mechanical systems and other miscellaneous equipment; convenience receptacle power; and interior and exterior lighting systems with controls.

The utility will bring Medium-voltage power at approximately 15,000 VAC to feed the facility transformer. The transformer will step down the voltage to 480 volts.

Power for the facility will be 480Y/277V, 3 phase, 4 wire, with solid neutral. All large equipment will be served at the highest voltage possible, 480 volt three phase. All equipment will be coordinated to ensure the utilization equipment will be served at their required voltage.

The electrical distribution system will be set up to comply with LEED. Loads will be segregate the load by type; life safety, lighting, and mechanical equipment. Meters to verify the load for each of these loads types will not be initially installed, however it would be a simple task to add them in the future.

CALGreen receptacle control will be achieved by tying receptacle control devices into the lighting system control panel. The Lighting System occupancy sensors will be utilized to turn off, 50% of the receptacles within a room when the room is not occupied.

A fully addressable fire alarm system will be provided for the facility. The fire alarm system shall contain pull stations, smoke detectors, heat detectors, duct detectors for the HVAC system, monitor the buildings sprinkler system, and provide occupant notification in the case of a fire event. Premise monitoring will be provided by an off-site entity.

2.10.4 Lighting

Interior Lighting:
Lighting Systems for the facilities will utilize LED light sources. Dimmable drivers will be specified for the LED drivers. Daylight harvesting will be utilized wherever practical. Daylight sensors will be installed to allow the dimming of the LED lights when there is enough natural daylight within the space.

DESIGN CRITERIA NARRATIVE

Occupancy and vacancy sensors will be incorporated into a low voltage lighting control system for all interior and exterior lighting systems. All offices and small room shall be provided with occupancy sensor(s) as required for full room coverage. The facility lighting control shall operate on the following properties:

- An addressable lighting control system shall be provided. The system shall be programmed with normal building operational hours and shall turn the lights on and off in compliance with the hours of operation.
- All offices, bathrooms, back of house spaces, and other rooms shall be provided with occupancy sensors. All regularly occupied spaces shall be provided with vacancy sensors, all other spaces shall be provided with occupancy sensors. All sensors shall turn off the lights 5 minutes after no occupancy.
- All areas with natural daylight shall be provided with daylight harvesting. Once the sensor picks up there is enough daylight within a space the lighting control system shall dim the LED luminaires. The luminaires shall be dimmed to a minimum level of 10% while maintaining design footcandle levels.

Exterior Lighting:
Site lighting fixtures will be an LED light source. The fixtures will be controlled by a programmable low voltage lighting control panel. Luminaires shall be provided with occupancy sensors. The use of occupancy sensors in the exterior luminaires is suggested. The proposed control of the exterior lighting shall be:

- An addressable lighting control system shall be provided. The system shall be programmed with normal exterior lighting hours, on at dusk, off at dawn.
- After 11:00 P.M. the luminaires shall reduce to 25% light output. If the luminaire senses motion, the luminaires shall increase brightness to full bright. After 10 minutes of no motion the luminaires shall drop back down to 25%.

2.10.5 Emergency Power

The sites will be provided with an emergency generator. It is anticipated that the generator will provide to allow the facility to operate, but not at full capacity, in the event of a power outage/ emergency. The exact size of the generator has not yet been finalized. Coordination efforts with the SFMTA staff is required to ensure the generator will allow the facility to operate as the staff requires size to be determined in Final Design.

The code required emergency power for the lights will be provided with either internal battery back-up or a battery backed up inverter. These batteries will provide the code required back-up power. Some luminaires may be connected to the generator to provide operational lighting in the event of a power outage.

2.10.6 Electrical Sustainable Design Systems

Along with following the California Energy Code we will incorporate daylight harvesting and occupancy and vacancy sensors throughout the facility.

In addition to the above measures the use of photovoltaic panels to produce power is another option to increase sustainability for the project.

2.10.7 Electrical Communications

Electronic Communications System Overview:
Communications systems include a Structured Cable System, Public Address (PA) System, and a Telecommunications Grounding Connection.

This narrative describes the systems and basic operations of the communication system for the new Maintenance and Operation Building.

Governing Codes:
California Electrical Code (CEC) provides minimum safety requirements for these systems. Design and installation is based on the minimum CEC requirements, BICSI, and IT best practice and manufacturer's recommendations. Structured Cable System pathways will be based on current telecommunications performance standards.

Public Address (PA) System:
Amplifiers and speakers will be provided throughout parts of the facility and utilized through the telephone system or dedicated microphone. PA speakers will be strategically within the areas of the facility requiring a PA system to provide uniform sound coverage of those facility areas for all PA announcements.

Structured Cable System:
Intra-facility Structured Cable System pathways will be provided for owner provided equipment including, but not limited to: wireless access points (full building coverage if required), administrative workstations, shop workstations, fuel station.

DESIGN CRITERIA NARRATIVE

Telecommunications Rooms:
The facility will have a Main Telecommunications Room (MTC) for the Main Distribution Frame (MDF), Servers, security equipment, routers and switches. The MTC will also act as the Main Point of Entry (MPOE) for offsite service. Telecommunications Closets (TC) will be provided as required to provide connectivity to the Intermediate Distribution Frame (IDF) for all work stations. All rooms shall be designed for future expansion and be equipped with equipment racks and cable management systems for organized and efficient cable routing.

Grounding System:
A telecommunications grounding will be implemented to protect telecommunications equipment. The telecommunications grounding system will connect to the Electrical Safety Grounding System.

2.10.8 Electrical - Security

Electronic Security Systems Overview:
Security Systems include a Video Surveillance System (VSS), and an Access Control System. Security system devices will be strategically placed throughout the facility based on client requests, best practice, and industry standards. This narrative describes the systems and basic operations of each electronic security system for the new Transit Operations and Maintenance Facility.

Governing Codes:
California Electrical Code (CEC) provides minimum safety rules for these systems. Design and installation is based on the minimum CEC requirements, best practice and manufacturer's recommendations.

Systems Monitoring:
Security Systems will be monitored in operations or general manager office (TBD) with exact locations to be determined. Off-site monitoring, if required, can be included.

Video Surveillance System (VSS):
A VSS will be provided to real time and recorded video of critical areas and the vehicle parking areas. The VSS will utilize strategically located cameras for video monitoring and recording for forensic use. Real time monitoring and forensic play back will be available onsite (TBD). Viewing and playback can be viewed using password on computers or a dedicated VSS workstation. Video recording retention length to be determined.

Access Control System:
A card access system compatible with the existing systems to allow access to the site gates, building staff entry, and critical areas will be provided.

Building Access Doors:
Entrance into facility buildings through building doors will be controlled by a card reader system. When a valid RFID card is presented to the local card reader at the door, the lock will be opened, allowing ingress.

Entrance gates can also function on a schedule. For example, doors / gates may be left open during business hours for free ingress/egress, but after-hours ingress is controlled by the card reader system.

Intercom System (if required):
The facility will be equipped with an intercom system consisting of 2-way intercom stations located at desired locations in the yard and building.

The intercom system can be used in conjunction with the access control system as ingress or egress requests can be made from an intercom station.

Uninterruptible Power Supply (UPS) System:
A UPS system will be provided for security electronics to allow security electronics to maintain function in the event of a power interruption. Length of power back up to be determined.

2.10.10 Generator

2.10.11 Radio & Computer Aided Dispatching (CAD)

2.10.12 IT/Radio Team

2.10.13 Fare Collection

2.10.14 Bus CCTV Backend

2.10.15 Fleet Watch

DESIGN CRITERIA NARRATIVE

2.11 Functional Equipment

This section will cover the functional equipment required to effectively operate in a bus operation and maintenance facility.

2.11.1 Vehicle Lifts

Vehicle lifts are implemented in facilities to allow a technician to inspect and maintain the underside of vehicles. The advantages of vehicle lifts include ease of use, safety, and improved productivity. The selection of the appropriate lift should be carefully considered and designed for the specific functions within the bay. There are several factors to be considered in the appropriate vehicle lift selection including (but not limited to) the following:

- Function and bay sizing requirements
- Facility budget
- Type of vehicle
- Number of vehicle axles
- Wheelbase range(s) between vehicle axles
- Vehicle access and orientation in bay

2.11.2 Vehicle Lift Types

The following are lift types to accomodate the SFMTA Fleet. Portable lifts are ideal for supplementing flat bays with functional lifts. They offer flexibility for facilities and are an economical addition to a newly constructed, renovated, or existing facility. Portable lifts can be paired in any grouping to meet the bay needs to lift a wide range of vehicles. Together the set of lifts, most common sets include four or six, will lift a vehicle in unison. Because the portable lift raises the vehicle from the wheel or tire, it inherently prevents the mechanic from accessing areas behind the wheel such as the brake drums/rotors, the suspension, and the steering components of the vehicle.

Battery Powered (Wireless) Portable Lifts
The battery option brings a benefit from a planning and operating perspective, as well. Nearby electrical outlets to power the lifts are not required in each work area. The wireless column lifts are truly the most versatile of the mobile column lifts available. The wireless column lifts have no cords on the shop floor reducing clutter and promoting a safe and efficient facility environment. Wireless lifts address the issue of excess cables in a bay but this feature is a cost premium compared to wired lifts.

Some batteries can be charged with a standard outlet and do not require a specialty receptacle or voltage, which translates to savings on installation costs. Battery powered lifts can be stored in a dedicated, remote charging location to allow for a less cluttered bay and shop area.

Battery-powered options can be moved out to the shop floor as needed and then stored in a small charging zone when not in use.

Axle Engaging Lifts:
Axle-engaging lifts allows the mechanic to work on the vehicle while it is lifted and are ideal for heavy maintenance, tire repair, and body repair. The vehicles are lifted to a comfortable working height for technicians and allow for maintenance and inspection on all four sides and underside of the two- or three-axle vehicle. The wheelbase range can be tailored for the various vehicles maintained at the facility. Axle-engaging lifts come in two different styles: post (piston) and scissor.

The post (piston)-style lift allows for maximum operational clearance and comes in either two- or three-post configuration. Generally, the posts take up less space compared to the scissor-style lifts and allow greater work coverage underneath the vehicle.

The scissor-style lift comes in either two- or three-scissor configuration. The scissor containment box is shallower compared to the post-style lift and typically costs less to purchase and install. The shallower containment box is ideal for facilities located on a site with high water table or unstable soils.

The axle-engaging scissor-style lifts take up more space than the post (piston)-style lifts, creating a more constrained work setting for a technician. The articulating scissors have more moving parts which may result in more maintenance compared to a post-style lift. These lifts can be sold with an aftermarket bellows or skirt cover to protect the articulating scissor components and openings.

Platform, Pit-Emulating Lifts:
Platform or pit-emulating lifts are ideal for preventative maintenance and inspection operations. These lifts can either be flush mounted or surface mounted. The surface mounted configuration requires vehicle ramps to allow the vehicle to access the platforms. Additional space should be considered to allow for these access ramps.

The lifts can either rise straight up (vertical rise) or displace (parallelogram) in one direction or another.

In a Chassis or Undercarriage Wash Bay, the vehicle is lifted and displaced with the engine compartment positioned over a large, grated pit. The engine compartment, which typically collects the most dirt and grit, is washed, and the horizontal displacement allows for the dirt and grit to fall into the pit below, instead of at the base of the lift.

2.11.3 Cranes and Hoists

Cranes and hoists allow a user to transport large components and equipment within various areas of a facility. It is important to define what functional areas of a facility need to have crane coverage in an effort to define the crane's travel direction and select the correct crane type. There are several factors to be considered in the appropriate crane and hoist system selection including (but not limited to):

- Desired area coverage
- Interior clearance
- Building structural systems
- Coordination with other facility systems (such as mechanical, electrical, lighting, fire protection, overhead doors, etc.)

2.11.4 Crane Types

The following are crane types recommended for SFMTA.

Overhead Bridge Cranes:
Overhead bridge cranes allow for maximum coverage within a desired area. Bridge cranes include a single or double girder supported by end trucks which travel the length of the area on running rails and beams. The girder(s) carry a hoist used to raise and lower the large components or equipment. Bridge cranes are available as top-running or underhung configurations.

Top-Running Bridge Cranes:
Top-running cranes are typically used to lift heavier loads (above 20 tons). Top-running cranes require a bracket attached to the building structural system or an independent structural system entirely to support the crane's running rails for lateral movement. This crane support system limits the top-running crane coverage area.

A top-running double girder bridge crane creates a smaller profile compared to a single girder bridge cranes. Double girder cranes should be used in applications where minimal clearance is allowed for the bridge crane travel.

Top-running cranes are also beneficial if additional headroom is required. Because the single or double girder is positioned on top of the end trucks, it allows for additional clearance below the girder.

Jib Cranes:
Jib Cranes may swing through an arc to give lateral movement to any items. They are ideal for lifting items and transferring short distances of 20 feet or less. Jib cranes generally have a lower capacity limit than bridge cranes. Jib Cranes can be freestanding, foundation mounted, column mounted, or compression mounted/cantilevered. Jib cranes cover more of the floor space than a monorail hoist but less than an overhead bridge crane.

Monorail Hoists:
Monorail hoists are ideal for facilities or processes which require lifting and transporting materials along a fixed path, especially from one level to another. Despite operating on a fixed path, monorail hoists can provide flexibility by operating on curves, slopes, or multiple support tracks. Typically, the weight capacities for hoists are less than capacities of bridge and jib cranes.

2.11.5 Vacuum Systems

Part of servicing a vehicle fleet means regular interior vacuuming to keep vehicles clean for vehicle operators and passengers and to extend the useful life of the interior surfaces.

2.11.6 Factors in Equipment Selection

Typically, the larger the fleet is the more variables that enter into the decision of selecting the best-suited vacuum system for an agency. There are several factors to be considered in the appropriate vacuum system selection including (but not limited to):

- Length of service cycle
- Type, size, and number of vehicle to be vacuumed
- Positioning of the vacuum

DESIGN CRITERIA NARRATIVE

2.11.7 Vacuum Equipment Types

Since SFMTA will be cleaning the interior of the buses in the parking positions backpack-type and cannister-type vacuums will be beneficial.

Backpack-type Vacuum:
Backpack-type vacuums allow cleaning staff to enter the vehicle and get a more intimate clean. Backpack systems work well for agencies who are looking to minimize initial costs of the facility and additional units/backpacks can be purchased as needed for future growth/replacement. Most backpack units require electrical connection and the cord can be difficult to manage when traveling into the vehicles.

Canister-type Vacuum:
The canister-type vacuum is a small, contained unit located on the service island with a typical maximum hose length of 25 feet and is similar to those found at gas stations.

For the shorter hose models, dust and dirt from the vehicle floor is swept toward the vehicle doors, then the canister vacuum is used to extract the dust and dirt. While relatively inexpensive and requiring only a small amount of space on a service island or housekeeping pad, the small size require the canister to be emptied frequently to a nearby trash receptacle. Also, the short hose length does not allow for full-length vehicle vacuuming for longer vehicles. Although the extraction power is not as effective, some vacuum models include hose lengths up to 50 feet.
The canister-type system can be appropriate for smaller fleets with limited service island space and service budgets. Another advantage is the ability to quickly service and replace an entire canister if necessary.

2.11.8 Vehicle Exhaust Systems

Vehicle exhaust systems are required to remove harmful vehicle exhaust (such as diesel, gasoline, or CNG). Even though vehicles are run only a short time indoors and with open doors, the vehicle exhaust can build up within the building. Without appropriate control and removal of the exhaust, fumes can lead to worker illness, increased facility maintenance, and damage to sensitive components and electronics.
The most effective method of capturing and removal of vehicle exhaust fumes is to capture them at the source. Capturing these gases at the source provides a safer and more pleasant working environment.

2.11.9 Factors in Equipment Selection

There are several factors to be considered in the appropriate vehicle exhaust system selection including (but not limited to):

- Type of vehicle
- Size of vehicle exhaust
- Type of vehicle fuel
- Exhaust location on vehicle(s)
- Facility budget
- Functional bays requiring vehicle exhaust
- Orientation of vehicles in bay

2.11.10 Equipment Types

Vehicle exhaust systems will be required at the Paratransit Facility.

Hose Reel Exhaust System:
These systems are ideal for facilities with high ceiling or roof structure. The compact design is ideal in instances where other equipment, such as overhead cranes, need to be considered or where taller vehicles must pass. The hose reel can either be spring or motor-operated to activate the exhaust fan. Exhaust systems can either be individually exhausted to the exterior or tied into one central system. Vehicle exhaust reels that are individually exhausted promotes energy efficiency because the only air drawn from the duct is from the vehicle with the running engine. A more powerful fan must be used with exhaust reel systems that have connected ductwork due to the extended distance required to exhaust the products of combustion along with the potential of drawing air from the exhaust reels that are not in use. Central systems tend to use more energy as they require larger fans/motors, however, they require fewer penetrations to the exterior of the building. If this system is desired, it is important to consider adding a monitoring system that can help limit energy use by matching the speed and draw of the central fan with the number of reels being used.

2.10.11 Vehicle Wash Systems

Wash Systems play an important role in maintaining the entire fleet. Vehicles that are cleaned properly last longer, and create a more enjoyable experience for both the staff maintaining the vehicles and the public.

DESIGN CRITERIA NARRATIVE

2.10.12 Factors in Equipment Selection

Understanding the capabilities of each type of system will ensure that the range of vehicle types are washed thoroughly while being conscience of environmental goals for the project.

There are several factors to be considered in the appropriate vehicle wash system selection including (but not limited to):

- Frequency of Wash
- Desired Wash Time
- Desired or Expected Cleanliness
- Number of Vehicles Washed
- Size of Wash Bay
- Facility Budget
- Type of Vehicle
- Profile of Vehicle
- Water Treatment
- Water Reclamation
- Stormwater Capture & Other Sustainable Practices
- Air Dryers/Wipers
- Climate & Environment/Elements
- Bike Racks on Buses
- Vehicle-mounted Equipment

2.10.14 Types of Wash Systems

A Chassis Wash System is recommended for SFMTA Paratransit.

Chassis Wash:
Chassis Wash Bays are a great addition to any Wash System. In order to properly clean the underside and chassis of the vehicle, the vehicle can be elevated with a Vertical Rise or Parallelogram Lift in a designated Chassis Wash Bay. This function will also require a High Pressure Hot Water Heater/Sprayer. This unit as well as the console for the lift may be placed in a designated area away from the majority of the spraying/cleaning operation.

2.10.18 Compressed Air and Lubrication Distribution Equipment

The compressed air and lubrication distribution systems are two important aspects of a facility that provide ease of use for the mechanics working in a multi-bay facility. The compressed air and lubrication piping will need to be sized properly to support the shop equipment throughout the facility. The lubrication equipment needs to support the vehicles being serviced in order for the facility to be most efficient.

2.10.19 Factors in Equipment Selection

There are several factors to be considered in the appropriate compressed air and lubrication system selection including (but not limited to):

- Number of Bays
- Lubrication Fluids needed at each location
- Length of longest piping run
- Monitoring Technology

2.10.20 Equipment Types

Rotary Screw Compressors:
These types of compressors use two rotors or helical screws to compress air to produce compressed air. Rotary screw compressors are quieter than piston units, allowing a quieter work environment while operating relatively energy-efficiently. Operating temperatures are at least 100°F cooler than piston units, resulting in longer life.

Because the moving parts of a screw-type compressor do not produce as much friction as the piston-type compressor, screw-type compressors are about 30% more efficient in producing compressed air with the amount of power that it consumes while in operation.

Rotary screw compressors are most efficient when in constant operation because they require 6 minutes to ramp down from compression duty. During this time, the compressor is not fully loaded but still requires some amount of power input that does not produce any compressed air. However, the amount of time required to ramp down from compression duty will be reduced to about 20 seconds when the unit is operated by a variable frequency drive (VFD).

The maintenance (long-term) cost of a rotary screw compressor is one major drawback because the more complex equipment with electronic components requires more regular maintenance compared to piston-type compressors. However, because screw-type compressors do not operate with as much friction as piston-type compressors, the frequency of maintenance duty is significantly less than piston-type compressors.

Reciprocating Piston Compressors:
Piston compressors are typically used for general-purpose applications such as workshop-air, where the air is used for hand-tools, cleaning dust, small paint jobs, etc. It is one of the most commonly used compressor types. Piston compressor are available from 1 HP to about 50 HP. The motors can be duplicated (duplex) in effort to double the power output (horsepower) and can then be

configured in a lead-lag operation to ensure equal wear on the motors and to increase the energy efficiency of the compressed air production.

Piston compressors are more economical compared to rotary screw compressors because they require less maintenance and work well in maintenance shops as they are more suitable for high pressure applications.

Piston-type compressors have a simple design and can be more easily fixed by facility maintenance staff compared to a screw-type compressor.

There are a few drawbacks to piston compressors such as excessive noise, high outlet temperature, and high oil content in air piping. These can all be mitigated through engineering a system appropriately.

Refrigerated Air Dryers:
An air dryer is an integral piece in compressed air treatment system. Air quality can have a significant impact on compressed air tools and equipment. Properly treated compressed air, and the right air dryer, will improve productivity, system efficiency, and product or process quality. Refrigerated air dryers are specifically designed to handle the high discharge temperatures of piston compressors. The purpose of using a refrigerated air dryer is to remove entrained moisture in the air to prevent corrosion in air tools with moving steel parts. Refrigerated dryers typically provide dew points of 40 °F at rated conditions.

A few filters are required to be used in compressed air systems. The filter downstream of the compressor and upstream of the dryer is the particulate air filter. This type of filter removes any dust or particulates in the air. The second filter located downstream from the dryer is the coalescing air filter. This type of filter removes the excess oil and water left in the air by the compressor and the dryer.

Desiccant Air Dryers:
These types of air dryers do not require any power to dry the air, as is the case with refrigerated air dryers. These types of dryers utilize a filter that captures the entrained moisture in the compressed air. Desiccant dryers trap so much of the moisture from the air that they typically reduce the dew point temperature to -40°F.

Compressed Air Receivers/Tanks:
Air receivers are pressure vessels that store treated or untreated compressed air. The air stored in these vessels alleviates the frequency of starts required by the compressor whenever compressed air is used. Some reciprocating and rotary screw compressors can be mounted on an air receiver but some are base/floor-mounted.

Bulk Fluid Storage Tanks:
Bulk Storage Tanks allow facilities to store large quantities of fluids while meeting required codes with double wall containment. Tanks can be monitored to promote more efficient product inventory control and throughput data. Tanks are available in sizes from 100 gallons to 50,000 gallons based on the frequency that the facility wishes to receive fluid deliveries. These tanks can also be utilized for waste/used fluids such as Used Oil and Used Coolant. Tanks are typically stored in a central location along an exterior wall for reduced piping lengths and ease of delivery and extraction of bulk fluids.

The amount of waste from empty bottles and jugs, the amount of time it takes to handle each bottle, and the amount of spilled fluid is greatly reduced when using bulk fluid storage tanks. Bulk fluid storage tanks typically hold amounts of liquid greater than 100 gallons for the use of all mechanics within the building. A tank level monitor is an integral component of the storage tank and will signal the low-level condition at which point the lubrication distributor would refill the storage tanks. Storage tanks are also equipped with a leak sensor which signals an alarm to sound in the event of a leak.

Bulk fluid storage tanks are typically double-walled to conform to the code requirement for spill containment. Another method of containing leaks is to provide a recessed concrete pit in the bulk fluid storage room directly underneath the bulk fluid tanks. Whichever method is chosen, 110% of the storage capacity of the tank needs to be contained in the event of a leak, as required by code.

Delivery Pumps:
Fluids need to be pumped from the bulk fluid storage tanks to the point of application in the maintenance bays area.

Piston Pumps:
Pneumatically-powered piston pumps are powerful enough to transfer the fluid from the storage tank to the point of application, hundreds of feet away. Piston pumps can be mounted

directly on top of the tank in order to dampen vibrations. Piston pumps are loud pieces of equipment [73 - 80 dB(A)]. This is one reason to enclose the lubrication storage area with heavy walls to dampen the noise.

Diaphragm Pumps:
Diaphragm pumps can also be used to pump fluid from the bulk fluid storage room to the maintenance bays. These pumps do not offer any mechanical advantage – the pressure of the compressed air supply is equal to the pressure of the fluid at the discharge end of the pump at a low flow condition. Diaphragm pumps are typically used for diesel exhaust fluid and engine coolant but are also capable of transferring engine oil, hydraulic oil, automatic transmission fluid, windshield washer fluid, diesel fuel, and gasoline. Special precaution needs to be taken in pumping diesel exhaust fluid to protect the pump and components against corrosion from this type of fluid. Diesel exhaust fluid pumps have either only plastic parts that contact the pumped fluid or it contains stainless steel components.

Another special case involves the pumping of engine coolant when the coolant is provided as a concentrate. A 30 gallon drum of water with a float valve is typically specified when mixing the concentrated engine coolant with the water. The diaphragm pump handles the mixing duty to supply a mixture of coolant to water at the desired ratio.

Piping:
The size of each pipe varies according to the distance that the fluid travels from the storage tank to the point of application. In order to determine the size of the pipe required to ensure that fluid will transfer from the lubrication storage room to the point of application, the lubrication system designer will need to know how many dispensers stemming from the same pipeline header are requested to be in use at any given time. Generally, the pipe size increases as the demand of fluid flow increases. Pipes with a smaller inside diameter restrict the fluid from flowing more than pipes with a larger inside diameter. Wall thicknesses also need to be considered when selecting the pipe in order to provide the rigidity necessary to keep the pipe from bursting. The fluid pressure within the pipe is typically 1000 psi and even more for chassis grease.

The cross section of a header can be designed to decrease over the length of the run from the storage tank to the maintenance bays. This will help to decrease the cost of materials and will also ensure an acceptable fluid pressure at the point of application. The lubrication system designer calculates the size of pipe based on fluid mechanics equations. The pumps are also sized in this way to ensure that the pipe length and the pumps are paired to dispense fluid at the furthest point of application.

The type of the pipe selection varies according to the type of fluid being transferred. Bulk fluid liquids may flow through carbon steel. Compressed air will be routed through copper to prevent corrosion. Compressed air does not require pipe of a high tensile strength because it operates at a comparatively low pressure than other fluids.

Lubrication/Commodity Hose Reels and Nozzles:
Lubrication Hose Reels are stationary units in the bays and piped from Bulk Storage Tanks. These reels are located in areas where maintenance and re-filling of fluids occurs, typically overhead on columns or mounted to nearby walls. Technicians have the ability to quickly dispense and measure fluids being dispensed into vehicles.

Hoses comprise the final length of fluid transfer material before exiting through the point of application, the nozzle. Hose reels offer the convenience of retracting the hose with no significant effort by the user to move the hoses out of the work space. This eliminates tripping hazards and it decreases the amount of time it takes to move the hose from the work area. Multiple hose reels can be grouped in parallel and mounted onto the same bracket. In this case, the reels become a reel bank. Hose reels are typically installed overhead on columns, mounted to nearby walls, or are suspended from the ceiling structure. The fluids that the mechanics will be able to dispense include automatic transmission fluid, engine coolant, two types of oil, chassis grease, gear oil, windshield washer fluid, diesel exhaust fluid, compressed air, and water.

Fluid Management System:
The volume of several types of fluids that the mechanics dispense can be tracked by use of the fluid management system. The amount of each type of liquid can be monitored by the Fleet Manager to determine the appropriate time to order more bulk fluid from the distributor. The fluid management system tracks the amount of each dispensed liquid by each individual nozzle.

With the fluid management system, the user can enter the amount of fluid that they would like to dispense from the nozzle. The pump air controls will allow the transmission of compressed air to the pumps by the storage tank to allow pumping to commence.

Waste Recovery System:
When mechanics drain fluids such as oil and coolant from the vehicles they maintain, they use a mobile receptacle to collect the used fluid. When the mechanics need to empty the used fluid containers, they can roll the units to nearby diaphragm pumps located in the maintenance area and pump the used fluid into their respective storage tanks in the lubrication storage room. Tank level monitors are typically installed in the tanks to signal an alarm to sound when the tank gets above a certain level. When the tank is full, a used fluid evacuation company can be contacted to remove the used fluid from the storage tanks.

2.10.21 Support Shop Equipment

Support equipment is included in many areas of the facility to supplement the functions associated with vehicle maintenance. Items such as workbenches, vises, buffer/grinders, drill presses, hydraulic presses, saws, blast cabinets, parts washers, jacks and stands, etc. are all part of an industry standard recommended equipment package.

2.10.22 Storage Equipment

Storage systems play a significant role in the layout and operation of a facility. Storage equipment can help with the organization of a facility, while promoting efficiency in operation and safety. Appropriately sized and located storage equipment also allows for flexibility of storage and shop spaces.

Parts and tool storage areas may consist of a variety of storage equipment items such as shelving units, drawer units, bulk storage and pallet racks, rack system with forklift/crane or motorized carousel and shuttle units.

2.10.23 Factors in Equipment Selection

There are several factors that need to be considered in the appropriate storage equipment selection including (but not limited to):

- Desired quantity of stored materials
- Security of stored materials
- Available square footage
- Available height in space

2.10.23 Equipment Types

Small Storage Equipment:
Small storage equipment is used to store a range of small to medium sized parts, materials, and tools. This storage equipment ranges from modular drawer units, shelves, lockable cabinets, and bulk storage racks. Best practices include a mix of these small storage equipment to increase flexibility for the facility.

Bulk, Palletized, and High Density Storage Equipment:
Bulk, palletized, and high density storage equipment uses the available vertical height and volume of a space to store the materials vertically as opposed to horizontal shelving like traditional shorter shelving racks. These systems reduce the overall space utilization for parts storage allowing a reduction in the total building area.

This type of storage equipment includes: parts carousels, vertical lift modules, pallet rack, and adjustable racking system.

One issue to consider is the vertical storage of materials may require additional fire protection/ suppression systems.

Parts Carousel:
Parts carousels are an automated parts retrieval and storage system which use the volume of a space to store large amounts of product in a small footprint. The automated system stores product in bins to maximize the storage capacity resulting in less wasted space compared to traditional shelving units.

The Parts carousel system uses bins of various sizes to store parts, materials, and tools. A digital control allows the operator to input a specific part number and the automated shuttle retrieves the tray with the requested part to an opening located at an ergonomic height. This system reduces the distance traveled by the operator to retrieve a parts, increases retrieval accuracy, and increases parts storage security. They also benefit the shelf life of the parts by controlling the environmental and atmospheric impacts on the stored product. The parts carousel length, width, and height is tailored for the specific facility needs. Unlike a vertical lift module, the parts carousels cannot be added on to in the future for additional storage capacity.

Vertical Lift Module:
Vertical lift modules (VLMs) are an automated parts retrieval and storage system which use the volume of a space to store large amounts of product in a small footprint. The automated system provides greater flexibility in handling different parts, sizes, weights, and accessibility. The VLMs store the trays to maximize the storage capacity and results in less wasted space compared to traditional shelving units. It is estimated VLMs on average save 70-80% of building square footage compared to traditional shelving racks.

The system uses large trays which hold bins of various sizes used to store parts, materials, and tools. A digital control allows the operator to input a specific part number and the automated shuttle retrieves the tray with the requested part to an opening where the operator is standing. This system reduces the distance traveled by the operator to retrieve a part, increases retrieval accuracy, and increases parts storage security. They also benefit the shelf life of the parts by controlling the environmental and atmospheric impacts on the stored product. Another benefit of VLMs is that they offer a means to track inventory effectively.

The VLM length, width, and height is tailored for the specific facility needs. Unlike the parts carousel, if additional storage is needed, VLM height can be increased or extended to allow for increased storage capacity.

The VLM is a costly system compared to traditional storage shelving and racking, but when comparing it to the amount of equivalent space required to store the same amount of products on traditional shelving, the cost savings is nearly equal. This is due to the fact that the amount of constructed space decreases significantly.

The true savings are realized after the facility is operating as there will be less storage space to heat/cool over the life of the facility. Additionally, the parts staff does not need to spend a significant amount of time walking to retrieve and deliver parts and components.

Pallet Rack:
Pallet racks are the most cost effective high density storage solution. The racks are easy to install in a new, renovated, or existing facility and can easily be relocated. Pallet racks are appropriate for storage of larger materials and components.

Pallet racks require a forklift or pallet jack to access the palletized material stored on the racks. Although the pallet rack itself does not require a significant amount of floor space, the access required by a forklift takes up nearly three times the space of the pallet rack.

Adjustable Racking System:
Similar to a pallet rack, the adjustable racking system allows for the storage of larger materials, parts, and drums on removable pallets. Unlike traditional pallet rack the adjustable racking system allows for the pallets to be stored at varying heights based on the volume of palletized product. The adjustable racking systems range from 8- to 25-feet high, with the most common systems being around 13- to 15-feet high.

Pallets are stored in "bays" or sections which are sized according to desired pallet size or sizes. The horizontal bay configuration of these systems lends itself to ease of future expansion to the system if necessary.

Pallets are handled by a rack mounted, gantry-type overhead crane and mast. The crane and mast system allows for narrower aisles compared to traditional pallet racks, which typically requires roughly 50% more clearance for forklift access.

This system provides more consistent and organized product storage compared to traditional pallet racks requiring forklift-based solution.

4.10.24 Tire Storage Equipment

Fabricated Tire Racks:
Fabricated racks are an economical, durable and low maintenance tire storage option. They can be custom made to meet specific needs for storage capacity, space availability, and room configuration. They can be built vertically up to three tiers high for increased capacity. However, fabricated tire racks require additional equipment, such as a fork lift or pallet jack, for tire retrieval.

This presents the potential for injuries due to dropped tires during the retrieval process.

Depending on configuration, the racks can take up significant floor space, and racks need to be anchored in place to a wall.

DESIGN CRITERIA NARRATIVE

Stacking Tire Racks:
Stacking tire racks allow for vertical storage of entire racks of tires rather than just individual tires, producing time savings when moving large quantities of tires at one time. The racks can be stacked two to three racks high, taking advantage of the vertical space in a shop, while freeing up valuable floor space. The stacks also make it easy and efficient to move an entire rack of tires for shipment or relocation within the shop, rather than moving tires individually.

A forklift or hoist is necessary for retrieval and relocation of racks. Tire retrieval from higher levels of the stacking racks can pose hazards if the racks are fully stacked, or if there is a lack of room to maneuver. Because of the stacked configuration, bottom tires can get a flat spot if stored for too long.

Tire Storage Carousels
Tire Storage Carousel systems are one of the more advanced ways to store and organize unmounted tires only. They can be operated with minimal effort by one person for easy tire retrieval. The technician simply rotates the carrier frames, locates the desired set of tires, stops at the proper position, and then, removes the tires safely and efficiently at ground level, all at the touch of a button. In addition to increased efficiency, the system reduces the risk of injuries by letting the machine do the lifting.

Tire Storage Carousels are an automated tire storage system which use the volume of a space to store large quantities of tires in a small footprint. The systems store tires on a series of horizontal beams to maximize the storage capacity, resulting in less wasted space compared to traditional tire storage racks.

Unlike multi-tier tire racks, tire storage carousels bring the tire to the operator without the aid of a hoist or crane. This results in fewer accidents associated with lifting heavy tires. Tire storage carousels are, however, limited to unmounted rubber tires only. Mounted wheels and tires must be stored on conventional tire storage (floor mounted or multi-level shelving).

The tire storage carousel length, width, and height is tailored for the specific facility needs, including the size of tires to be stored. They are also available in lockable, weatherproof models for placement outside. The tire carousel enables the agency to keep an accurate count of inventory, since all tires are visible and are in one place.

There are a few downsides to tire carousels. As an automated piece of equipment, they require periodic maintenance. This means that tires are not accessible during repairs. The system also becomes inaccessible if an when the power is out. As with any equipment with moving parts, safety protocol is necessary to prevent injuries while the machine is in motion.

2.10.25 Fall Protection

Fall protection systems are necessary any time routine maintenance is being performed on the roof of the vehicle and operation of a facility. It is important to note that when fall protection systems are properly integrated into the overall design of the facility it is more likely they will be used on a regular basis.

2.10.26 Factors in Equipment Selection

There are several factors that go into the appropriate storage equipment selection including (but not limited to):

- Other Overhead Systems and/or Equipment
- Facility Budget

2.10.27 Equipment Types

Portable Fall Protection Systems:
A variety of portable systems are available that allow flexibility among the various bays and are typically less expensive and less impactful on the structure of the facility.

Possibly one of the greatest benefits to the portable fall protection systems is that they do not require any infrastructure such as special beams or bracing. They are a cost-effective solution to a facility renovation or upgrade. Additionally, they can be used anywhere in a facility, even areas with overhead crane equipment.

While these systems may seem like a viable option, one of the drawbacks to these systems is the effort required to move these into position to access the vehicle roof.

Overhead Fall Arrest Systems:
Overhead Fall Arrest systems are engineered systems designed into the structural building system. These systems typically operate along a mono-directional path to allow personally to travel the length of the vehicle roof.

The two main options for structurally integrated fall arrest systems are I-beam or track systems. Each option offers a variety of designs that can be

tailored to the specific vehicle and condition fall arrest condition.

I-Beam Fall Arrest System:
The I-Beam Fall Arrest System is integral to the structure of the building attached to the I-Beam above.

Track Fall Arrest System:
Track Fall Arrest System is a separate track that is provided by a manufacturer

Pit Protection Systems:
Lower Level Work Areas/Pits require a system to eliminate a potential fall into an open pit. The two main systems are removable steel pit covers and movable nets suspended from cables. Each design allows the technician working in the pit to access the area which they are performing maintenance or inspection work while protecting the opening above.

Steel Pit Covers:
The steel pit covers are customized to fit the width and length of the pit opening. The pit covers are positioned on an embedded angle in the pit opening and are typically flush with the finish floor to lessen the chances of personnel tripping while near the opening. The small openings prevent most tools and parts falling through the pit.

The pit covers are removable and allow the mechanic to remove one or multiple adjacent sections to access the underside of a vehicle. The pit covers simply stack on the adjacent cover and when the work is complete, the mechanic slides the section back into place.

Typical lengths of pit covers range from three- to four-feet and must weigh less than 50 pounds per OSHA requirements. Another advantage of the steel pit covers is that they are easy to clean off any oils and grease.

Pit Safety Netting:
The pit safety netting is a convenient solution to cover a pit opening. The netting allows a mechanic to enter a pit and easily drag the net the desired length of the opening to inspect the underside of a vehicle. Unlike the pit covers, if work is performed under the center of the vehicle or opening, the mechanic is required to drag the net to the required work position. Whereas the pit covers can be removed a section at a time. Once work on the vehicle is complete, the mechanic must drag the netting to effectively 'close' the opening. If this is forgotten or not performed, the mechanic may drive the vehicle out of the bay and expose the pit opening resulting in a safety hazard.

One advantage of the pit netting is a low installation costs. However, there are significant drawbacks of nets including they will sag over time and should be replaced as recommended by the manufacturer, effectively offsetting the lower initial installation costs. Unlike the pit covers, the netting openings do not prevent small tools and parts from falling through the pit opening. These openings can also be a hazard for personnel who may trip and fall into the pit netting.

INTRODUCTION

This document presents the Design Criteria for the proposed Hatch San Francisco SFMTA facilities, by providing both micro and macro level design requirements. The Design Criteria format found in this section consists of Functional Area Modules. The Functional Area Module represents a detailed description of specific design issues for each of the areas listed in the Space Needs Program. Reference Space Needs Program for specific Scenarios. All Modules and related equipment are for representation purposes only and do not necessarily depict strict design conformance.

3.0 Sustainable Design

There are several sustainable design opportunities which can be approached at the new San Francisco SFTMTA facilities. Regardless of whether San Francisco Metropolitan Transportation Authority chooses to achieve LEED rating or not, these are good design practices. The Sustainable Design section outlines potential sustainable design opportunities appropriate for this type of facility. These options are broken into site features, Building Design and Materials, Mechanical Systems, Electrical Systems, and Plumbing Systems.

3.1 Utilities Design

The utilities for the maintenance facility are numerous and require close attention to detail. The coordination of the HVAC, electrical, and plumbing systems are critical to the proper function of the Shop and the heart of the facility. Providing an organized installation and design of these systems will make them easier to maintain in the future.

3.2 Abbreviations

A	=	Amperes
ADA	=	American Disabilities Act
AFF	=	Above Finished Floor
AHJ	=	Authority Having Jurisdiction
ASHRAE	=	American Society of Heating and Refrigeration Association of Engineers
ATF	=	Automatic Transmission Fluid
BICSI	=	Building Industry Consulting Service International
BRBF	=	Buckling Restrained Brace Frame
CA	=	Compressed Air
CBC	=	California Building Code
CE	=	Computer Equipment
CEC	=	California Energy Code
CFC	=	California Fire Code
CFM	=	Cubic Feet Per Minute
CG	=	Chassis Grease
Circ	=	Circulation
CMC	=	California Mechanical Code
CNG	=	Compressed Natural Gas
CO	=	Carbon Monoxide
CO2	=	Carbon Dioxide
CPC	=	California Plumbing Code
CWA	=	Common Work Area
dB(A)	=	Decibels, A-Weighted
DEF	=	Diesel Exhaust Fluid
Demo	=	Demolition
Div	=	Division
DX	=	Direct Expansion
EC	=	Engine Coolant
Elec	=	Electrical
EO	=	Engine Oil
fc	=	Foot Candle
FPS	=	Feet Per Second
GFI	=	Ground Fault Interrupter
GO	=	Gear Oil
GPF	=	Gallons Per Flush
GPM	=	Gallons Per Minute
GSF	=	Gross Square Feet
H2	=	Hydrogen
HFHC	=	Hydrochlorofluorocarbons
HO	=	Hydraulic Oil
HVAC	=	Heating, Ventilation and Air Conditioning
ICC	=	International Code Council
IDF	=	intermediate distribution frame
IES	=	Illuminating Engineering Society
K	=	1,000 Pounds
lb	=	Pound
LED	=	Light Emitting Diode
LEED	=	Leadership in Energy and Environmental Design
LEL	=	Lower Limit Explosive Limit
LLWA	=	Lower Level Work Area
Max	=	Maximum
MDF	=	Maind Distribution Frame
Mech	=	Mechanical
Min	=	Minimum
MPOE	=	Main Point of Entry
MTC	=	Main Telecommunication Center
MUD	=	Mixed Use Development
NEC	=	National Electric Code
NFPA	=	National Fire Protection Association
NG	=	Natural Gas
NO2	=	Nitrogen Dioxide
OC	=	Overhead Cabinet
OSHA	=	Occupational Safety and Health
PA	=	Public Address
PDI	=	Plumbing and Drainage Institute
PDR	=	Production Distribution Repair
PES	=	Portable Equipment Storage
PSI	=	Pounds Per Square Inch
RFID	=	Radio-Frequency Identification
RLWP	=	Roof Level Work Platform
SF	=	Square Feet
Struc	=	Structural
TBD	=	To Be Determined
TBS	=	ToolBox Storage
TC	=	Task Chair
Typ	=	Typical
UC	=	Used Coolant
UO	=	Used Oil
UPS	=	Uninterruptible Power Supply
USGBC	=	United States Green Building Council
VAC	=	Volts AC
VCT	=	Vinyl Composite Tile
VLM	=	Vehicle Lift Module
VOC	=	Volatile Organic Compound
VSS	=	Video Surveillance System
W	=	Water
WWF	=	Windshield Washer Fluid

SUSTAINABLE DESIGN

3.3 Creating Sustainable Facilities

Sustainability is an essential and fundamental component of the facility. The key sustainability issues that should be explored in the planning and development of the facility include, but are not limited to, the following key points.

3.4 Balance Between Economic and Environmental Needs

To balance both economic and environmental needs that minimize environmental impacts, the facility design should maximize employee health, safety, and operation efficiencies. This priority objective should be considered at all stages of development of the facility.

3.5 Efficient Use of Resource Materials

Material resources are valuable and an efficient use should be encouraged in the development and operations of the facility. This can be implemented through the use of reusable, recyclable, and biodegradable materials as well as mandating the use of products that are extracted, harvested, and manufactured locally.

3.6 Efficient Use of Water Resources

The facility plan should encourage efficient use of water resources by sustaining habitats and ecosystems through resourceful planning. Examples could include the implementation of an effective storm water management plan and the use of environmentally compliant wash bays to service all vehicles.

3.7 Energy Efficiency/Renewable Energy Systems

Explore and promote opportunities to increase energy savings at the facility through the use of high-performance systems combined with utilizing renewable energy sources like solar, wind, and daylight harvesting.

3.8 Construction Methods

Methods of construction of the facility play a significant role in sustaining the environment. Utilizing strategies that minimize transportation costs by utilizing local resources and recycling procedures during construction to divert material from landfills will conserve energy and minimize pollution.

3.9 Sustainable Criteria

The following is a list of potential strategies to achieve sustainable building design.

- Operable windows/natural ventilation
- Lighting controls: Occupancy sensors, vacancy sensors
- Lighting designed to meet targeted LEED points
- Utilize daylighting strategies and daylight harvesting
- Provide user-adjustable comfort and lighting controls
- Underfloor ventilation
- In-floor radiant heating and cooling
- Water reclamation system
- Use of reclaimed water for vehicle washing

3.10 LEED Certifications

LEED, or Leadership in Energy & Environmental Design, is a green building certification program that recognizes best-in-class building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification. Prerequisites and credits differ for each rating system, and teams choose the best fit for their project.

Each rating system groups requirements that address the unique needs of building and project types on their path towards LEED certification. Once a project team chooses a rating system, they'll use the appropriate credits to guide design and operational decisions.

SFMTA guidelines are to meet LEED Gold Certification.

- Platinum 80+ points
- Gold 60 to 79 points
- Silver 50 to 59 points
- Certified 40 to 49 points

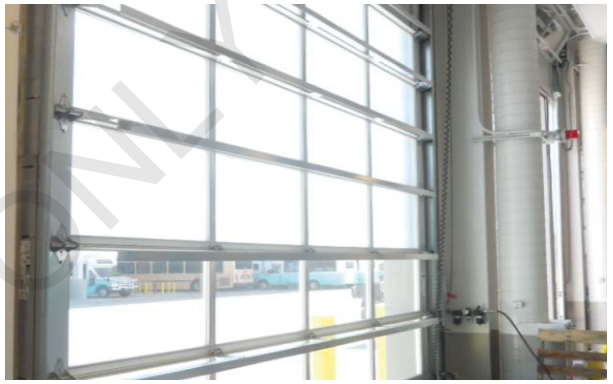
SUSTAINABLE DESIGN

3.11 Building Design and Materials

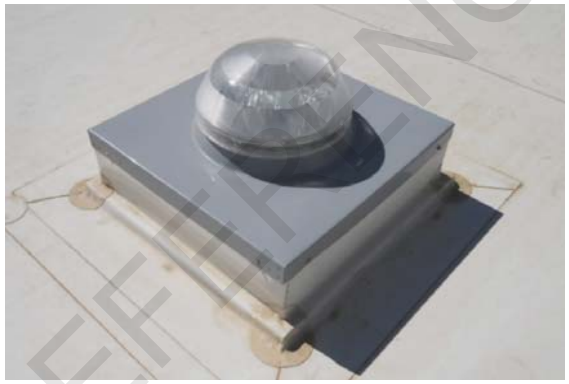
Design and materials that facilitate sustainability include, but are not limited to:

- Use durable long lasting building materials
- Natural light
  - ✓ Skylights
  - ✓ Clerestory
  - ✓ Roof monitors
  - ✓ Windows in bay doors
- Operable windows for natural ventilation
- Low Volatile Organic Compound (VOC) finish materials
- Use of local building products
- Use of recycled content of materials
- High R-Value roof and wall insulation
- Insulated value bay doors
- Low U-value windows and skylights
- Cleanable and maintable light colored reflective floors, walls, and ceilings

Translucent clerestory windows natural light



Insulated translucent sectional door



Solar tube day lighting strategy

Light reflective floor

SUSTAINABLE DESIGN

3.12 Mechanical Systems

Mechanical systems that facilitate sustainability include, but are not limited to:

- Additional cost alternative: Radiant floor slab heating
- Variable air volume air handling units
- Variable frequency drive motors
- High efficiency motors for air handling units and DX compressors
- Economizers for free cooling with 100% outside air at air handling units
- Demand control ventilation with CO2 and occupancy sensors for reducing ventilation requirements during unoccupied periods

3.13 Additional Cost Alternatives

- Radiant floor slab heating
- Thermal solar heating for domestic water heater
- High efficiency boiler for hydronic heating loop
- Ground source heat pumps
- Destratification fans

Destratification fan

Heat recovery piping

Underfloor air distribution vent

Radiant floor system

SUSTAINABLE DESIGN

3.14 Electrical Systems

Electrical systems that facilitate sustainability include, but are not limited to:

- Provision for photovoltaic panels to be installed on the roof
- Provision for future photovoltaic panels to be installed on shade structures located in the parking lot
- Maximize lighting controls with daylight harvesting and occupancy and vacancy sensors
- LED lighting systems
- Task lighting in Repair Bays
- Efficient process equipment

LED lighting

Photovoltaic panels on roof

3.15 Plumbing Systems

Plumbing systems that facilitate sustainability include, but are not limited to:

- Rainwater harvesting for irrigation
- Vehicle wash water reclaim
- Low flow plumbing fixtures
- Sensor operated faucets
- Grey water (purple pipe) for water closets
- Tankless water heaters

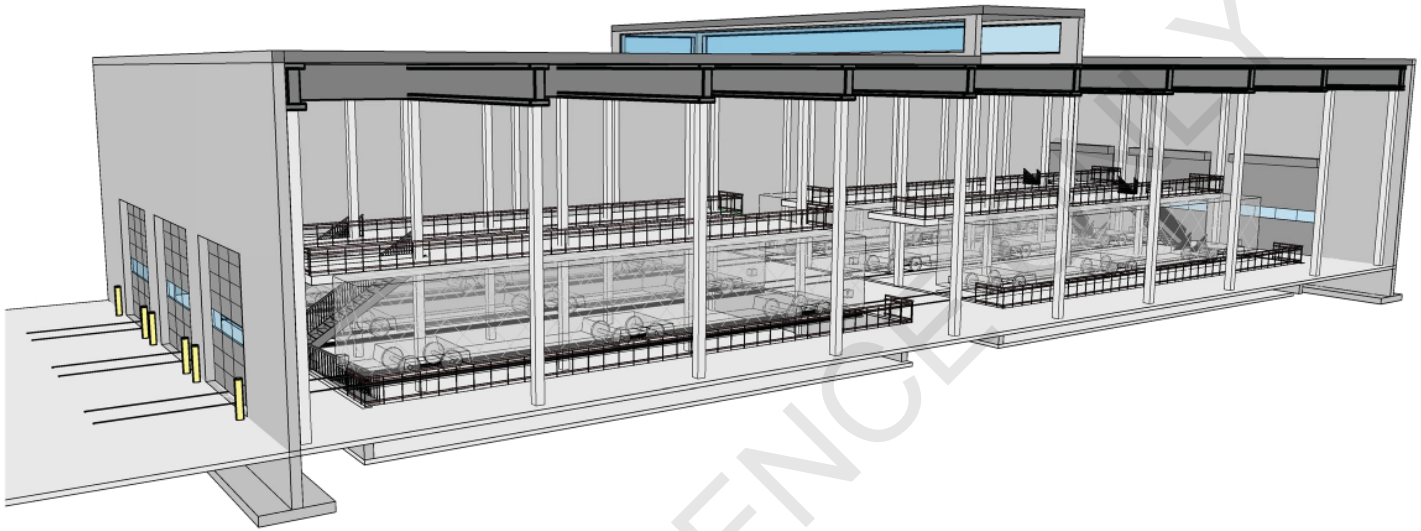
Dual flush toilet

Low-flow plumbing fixtures

Wash water reclaim system

Rainwater harvesting

UTILITIES DESIGN



4.0 Architectural/Structural

- Coordinate routing, support systems, and clearances for mechanical ductwork, plumbing piping and electrical conduit
- Routing shall run above forklift and walk aisles
- Group wherever possible

4.1 Mechanical Systems

- Route main ventilation ductwork above walk/ forklift aisles
- Use mezzanines for mechanical units

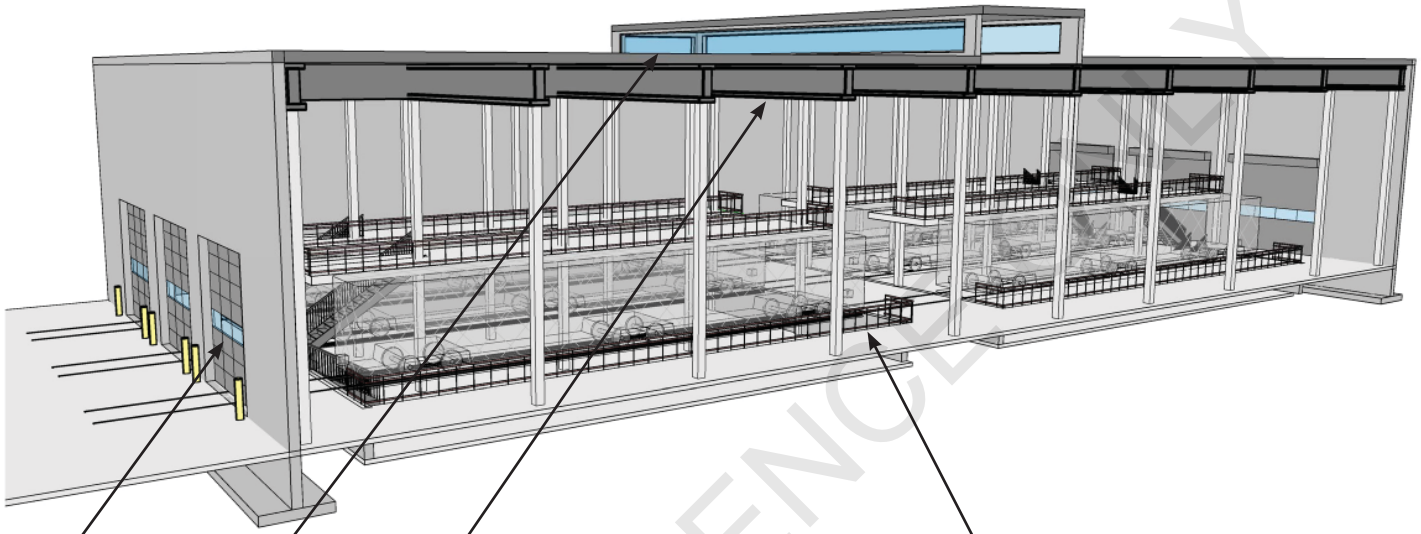
4.2 Plumbing Systems

- Route water, gas, service equipment piping above ground and above walk/forklift aisles

4.3 Electrical Systems

- Route main conduit runs above ground and above walk/forklift aisles.
- Communication systems
- Route branch circuits, equipment feeds above ground to facilitate future renovations

UTILITIES DESIGN

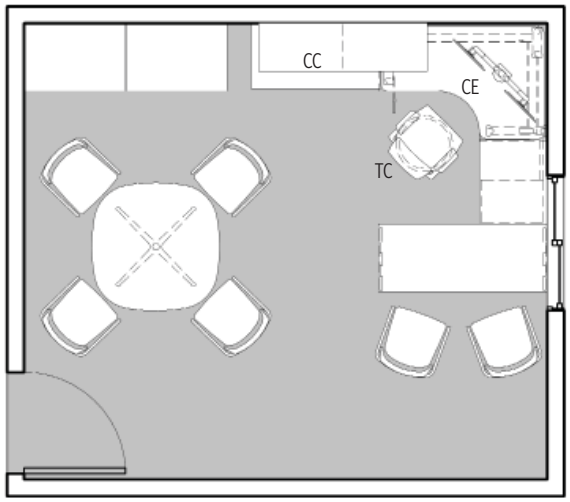


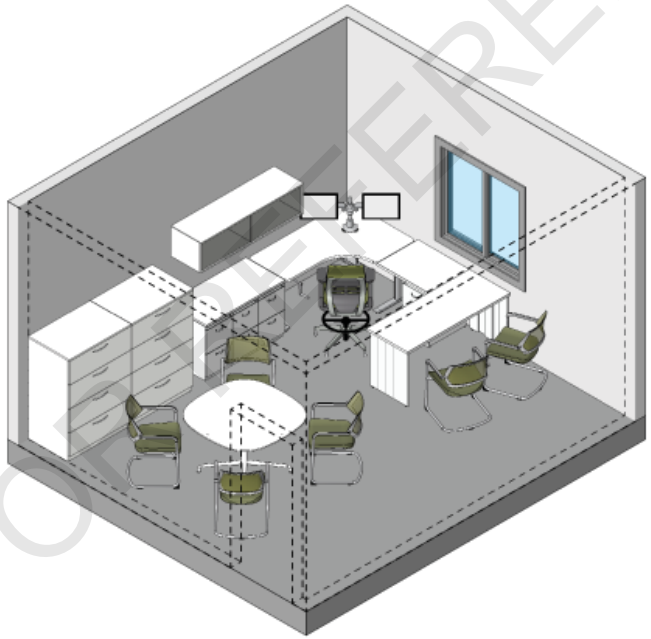
- Geothermal
- Daylighting through skylights/clearstories/roof/ monitors/windows in bay doors
- Low VOC finishes
- Operable windows/natural ventilation
- Use of recycled content of materials
- Destratification fans in high bay areas

- Radiant floor slab heating
- Air quality sensors for exhaust fan controls
- Use of durable, long-lasting buildign materials
- Occupancy sensors
- View windows in overhead doors
- Use of local building products

OFFICE MODULES

PRIVATE OFFICE - 224 SF





FUNCTION

Private office for completing work tasks and holding small meetings.

RELATIONSHIP TO OTHER AREAS

- Case specific; reference general module: office areas specific to each group

RECOMMENDED CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

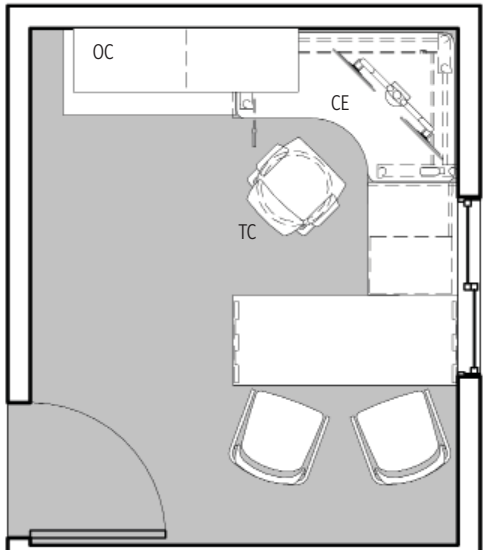
TYPICAL EQUIPMENT/FURNISHINGS

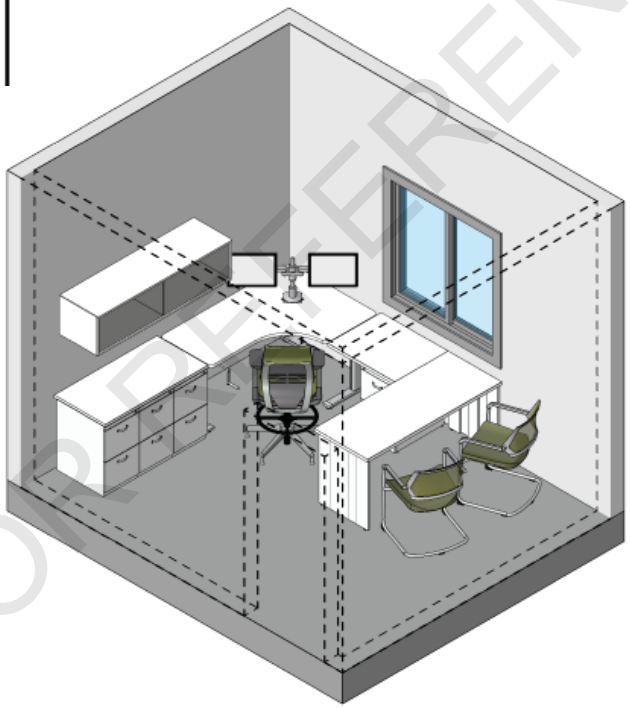
- Task chair
- Sit/stand workstation
- Under surface vertical files
- Cabinets
- Table & Chairs

TYPICAL DESIGN FEATURES

- Furniture: Use owner furniture standards (if applicable)
- Flooring:
  - ✓ Carpet tile floor with rubber base for Administration or Operations areas (recommended)
  - ✓ Resilient floor covering with base for maintenance areas (recommended).
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Doors: Single leaf 3'-0" door with loadable lever set hardware (recommended)
  - ✓ Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degree Fahrenheit
  - ✓ Cooling set point: 74 degree Fahrenheit
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (35 foot candles average)
  - ✓ Provide (four minimum) general purpose duplex receptacles and a quad receptacle at each workstation
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and conduit rough-ins to three other locations in room
- Lighting Control:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

PRIVATE OFFICE - 120 SF





FUNCTION

Private office for completing work tasks and holding one on one meetings.

RELATIONSHIP TO OTHER AREAS

- Case specific; reference general module: office areas specific to each group

RECOMMENDED CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

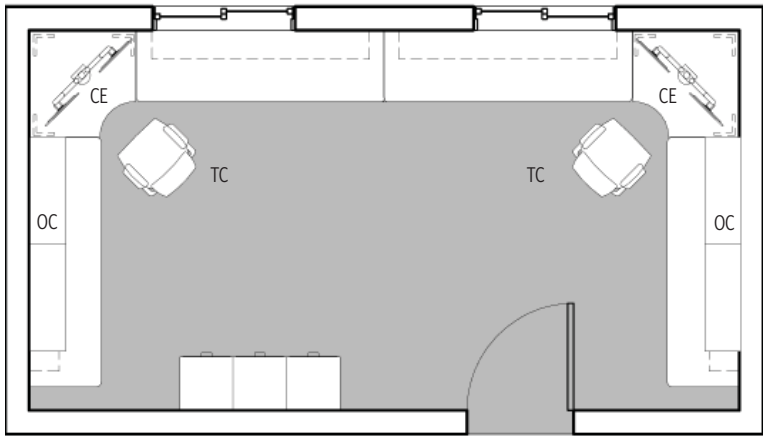
TYPICAL EQUIPMENT/FURNISHINGS

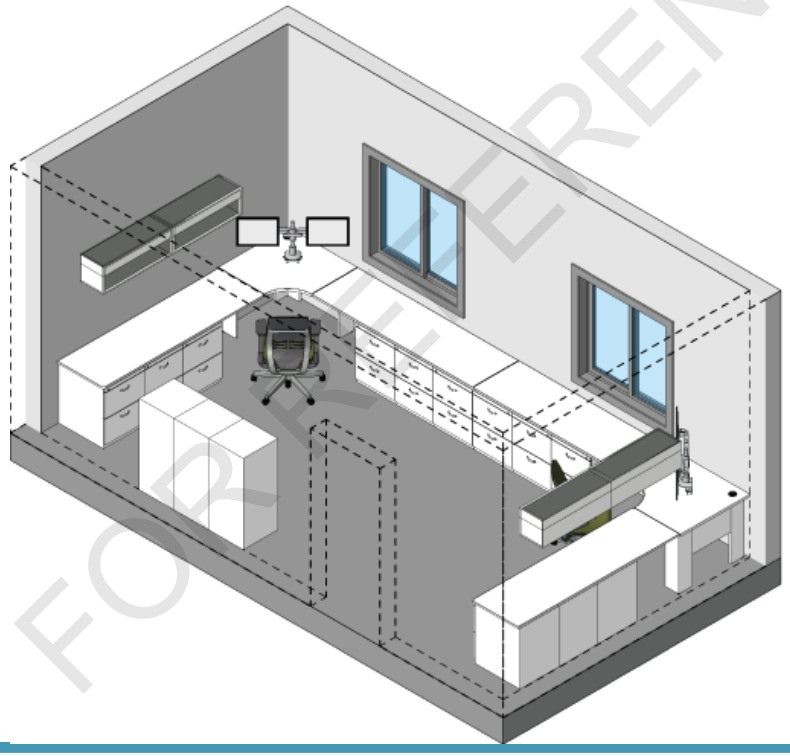
- Task chair
- Sit/stand workstation
- Under surface vertical files
- Cabinets
- Guest chairs

TYPICAL DESIGN FEATURES

- Furniture: Use owner furniture standards (if applicable)
- Flooring:
  - ✓ Carpet tile floor with rubber base for Administration or Operations areas (recommended)
  - ✓ Resilient floor covering with base for maintenance areas (recommended).
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Doors: Single leaf 3'-0" door with loadable lever set hardware (recommended)
  - ✓ Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degree Fahrenheit
  - ✓ Cooling set point: 74 degree Fahrenheit
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (35 foot candles average)
  - ✓ Provide (four minimum) general purpose duplex receptacles and a quad receptacle at each workstation
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and conduit rough-ins to three other locations in room
- Lighting Control:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

SHARED OFFICE - 120 SF





FUNCTION

Enclosed shared office with separate workstations for each occupant to complete work tasks.

RELATIONSHIP TO OTHER AREAS

- Case specific; reference office general module: office areas specific to each group

RECOMMENDED CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

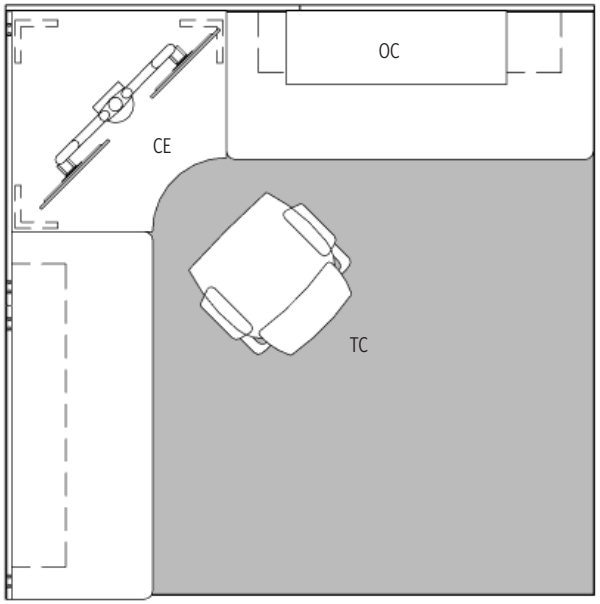
TYPICAL EQUIPMENT/FURNISHINGS

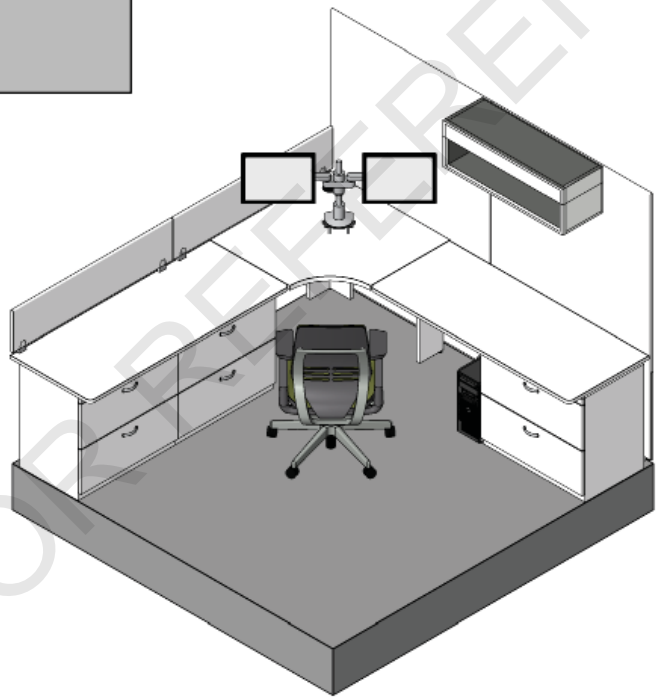
- Task chair
- Sit/stand workstations
- Under surface vertical files
- Cabinets

TYPICAL DESIGN FEATURES

- Furniture: Use owner furniture standards (if applicable)
- Flooring:
  - ✓ Carpet tile floor with rubber base for Administration or Operations areas (recommended)
  - ✓ Resilient floor covering with base for maintenance areas (recommended).
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Doors: Single leaf 3'-0" door with loadable lever set hardware (recommended)
  - ✓ Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degree Fahrenheit
  - ✓ Cooling set point: 74 degree Fahrenheit
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (35 foot candles average)
  - ✓ Provide (four minimum) general purpose duplex receptacles and a quad receptacle at each workstation
  - ✓ Provide one data outlet with four data ports at each workstation
  - ✓ Provide box and conduit rough-ins to three other locations in room
- Lighting Control:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

WORKSTATION - 64 SF





FUNCTION

Open office workstation to complete work tasks.

RELATIONSHIP TO OTHER AREAS

- Case specific; reference office general module: office areas specific to each group

RECOMMENDED CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

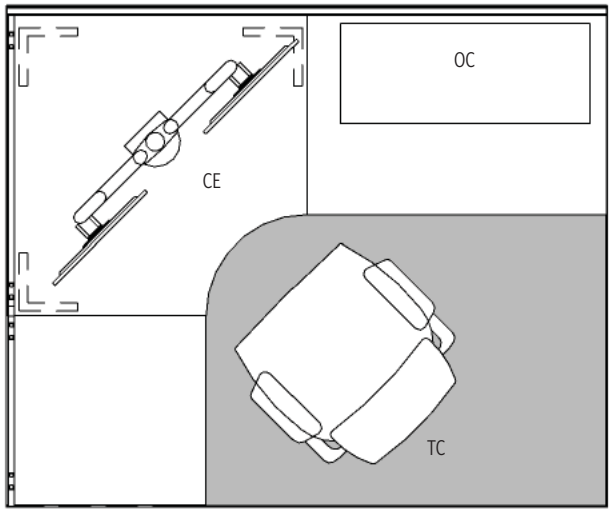
TYPICAL EQUIPMENT/FURNISHINGS

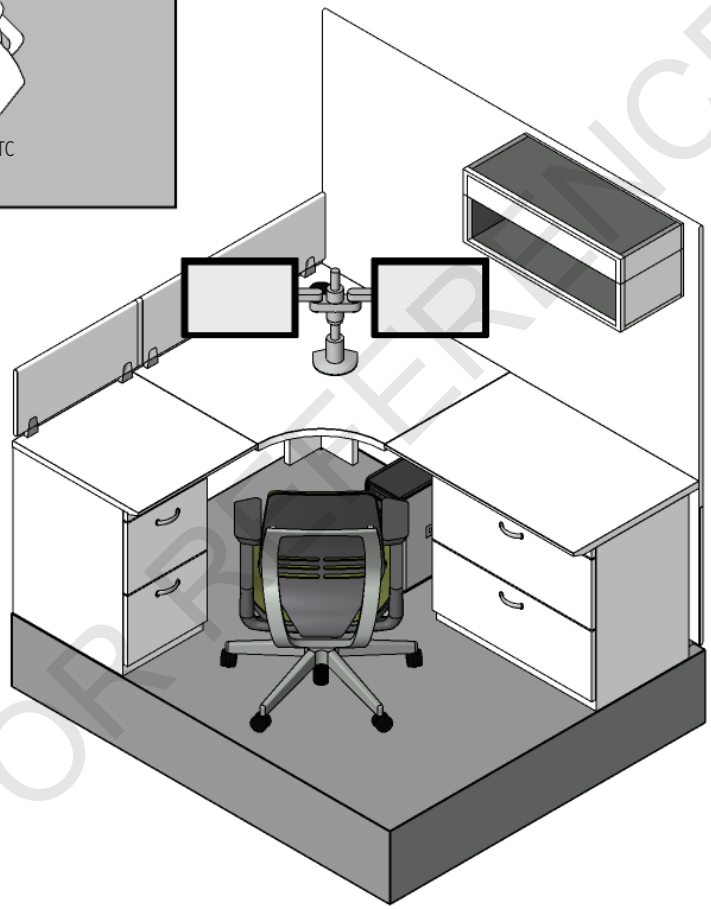
- Task chair
- Workstation
- Under surface vertical files

TYPICAL DESIGN FEATURES

- Furniture: Use owner furniture standards (if applicable)
- Flooring:
  - ✓ Carpet tile floor with rubber base for Administration or Operations areas (recommended)
  - ✓ Resilient floor covering with base for maintenance areas (recommended).
- Ceiling: Acoustical ceiling tile (recommended)
- Daylighting: Access to natural light
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED lighting in accordance with IES recommendation (35 foot candles average)
  - ✓ Provide (three minimum) general purpose duplex receptacles and a quad receptacle at workstation
  - ✓ Provide one data outlet with four data ports at workstation
- Lighting Control:
  - ✓ Verify feasibility of providing individual control of selected luminaires.
  - ✓ Task lighting (recommended as required)

WORKSTATION - 36 SF





FUNCTION

Open office workstation to complete work tasks .

RELATIONSHIP TO OTHER AREAS

- Case specific; reference office general module: office areas specific to each group

RECOMMENDED CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

TYPICAL EQUIPMENT/FURNISHINGS

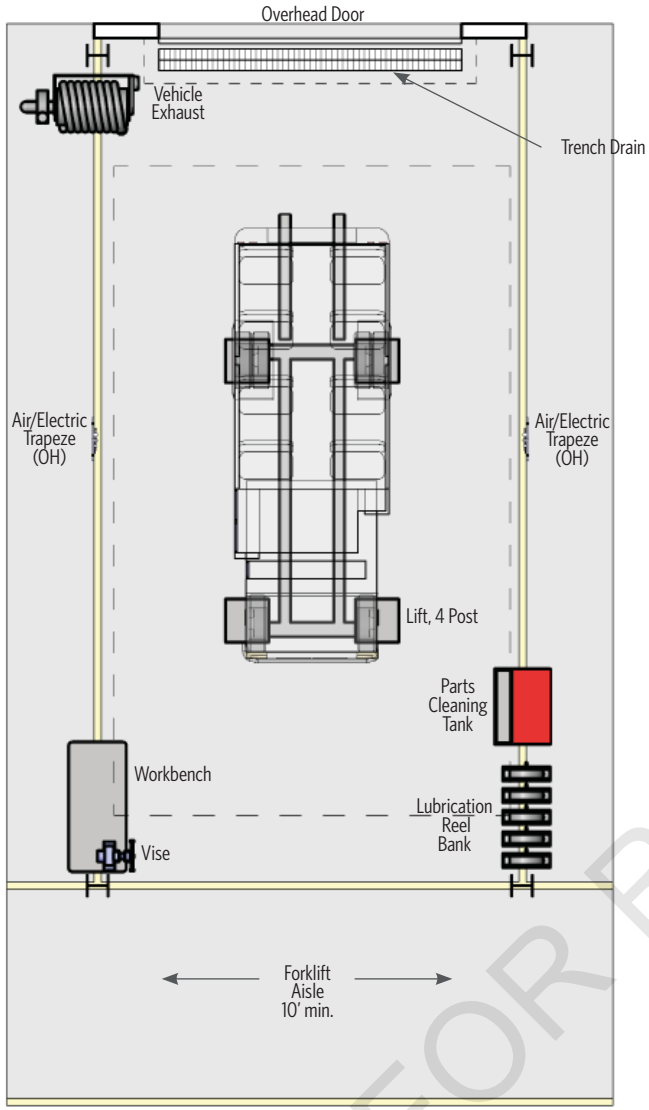
- Task chair
- Workstation
- Under surface vertical files
- Cabinets

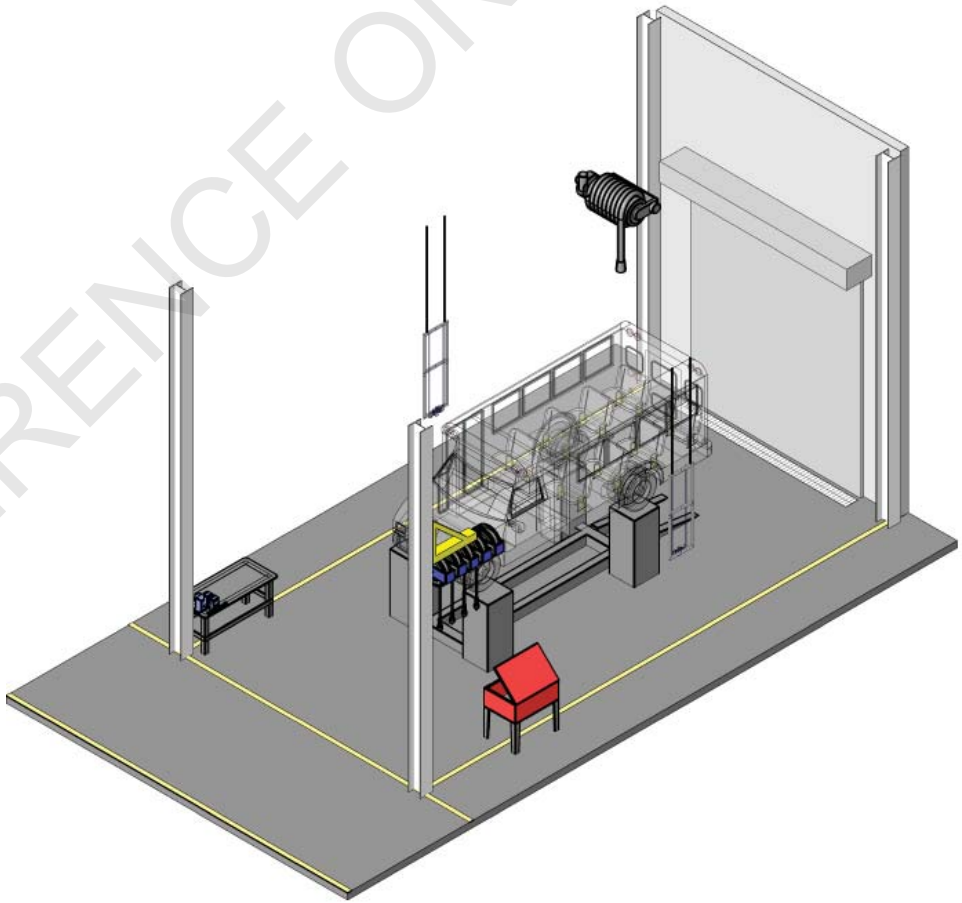
TYPICAL DESIGN FEATURES

- Furniture: Use owner furniture standards (if applicable)
- Flooring:
  - ✓ Carpet tile floor with rubber base for Administration or Operations areas (recommended)
  - ✓ Resilient floor covering with base for maintenance areas (recommended).
- Ceiling: Acoustical ceiling tile (recommended)
- Daylighting: Access to natural light
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED lighting in accordance with IES recommendation (35 foot candles average)
  - ✓ Provide (three minimum) general purpose duplex receptacles and a quad receptacle at workstation
  - ✓ Provide one data outlet with four data ports at workstation
- Lighting Control:
  - ✓ Verify feasibility of providing individual control of selected luminaires.
  - ✓ Task lighting (recommended as required)

BAYS, SHOPS, & PARTS

MAINTENANCE BAYS





MAINTENANCE BAYS

FUNCTION

Perform general repair and maintenance on paratransit vehicles.

RELATIONSHIP TO OTHER AREAS

- Access to Common Work Area, Portable Equipment Storage, Tire and Brake Shop, Parts Room, and Office areas

RECOMMENDED CRITICAL DIMENSIONS

- 19'-0" vertical clearance to structure and fixtures
- 20'-0" wide x 40'-0" long

TYPICAL EQUIPMENT/FURNISHINGS

- Severe use workbench with vise (one per bay)
- Parts cleaning tank (shared)
- Lubrication reel bank (shared one per two bays)
- Vehicle exhaust (one per bay)
- Air/electric trapese

TYPICAL DESIGN FEATURES

- Forklift access
- Blend of lifts and flat floor bays
- Natural Daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral non-metallic light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities with light colored finish
- Doors:
  - ✓ Personnel door with view panel to meet applicable code exit requirements
  - ✓ Exterior overhead doors: High-lifting sectional, steel, insulated, 14'-0" x 14'-0" with view panels, automatic operator, interior and exterior push button controls with lockout on exterior
  - ✓ Bollards on exterior at jambs of overhead door (two each)

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accomodate in-floor radiant heat (if desired)
- Floor slab designed to accomodate forklift access

MECHANICAL CONSIDERATIONS

- Wall mounted or overhead vehicle exhaust system with exhaust hose on a motorized reel with integral exhaust fan and automatic fan switch
- As required by equipment
- Ventilation:
  - ✓ Four air changes per hour continuous exhaust to clear any hazardous gas accumulation
- No heating devices with open flame or heaters with temperatures greater than 800 degrees Fahrenheit in Class 1 Division 2 rated areas (used for alternative fuels only)
- Heating set point: 65 degrees Fahrenheit
- In-floor radiant heat (if desired)

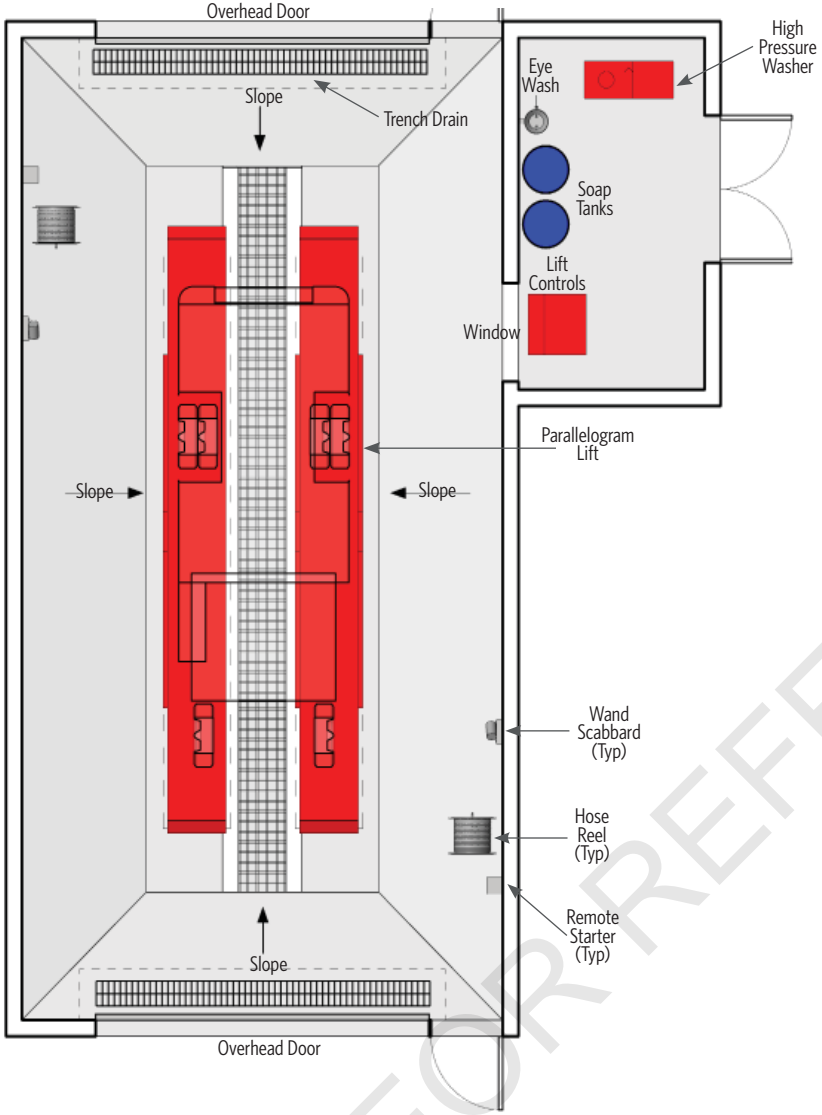
PLUMBING CONSIDERATIONS

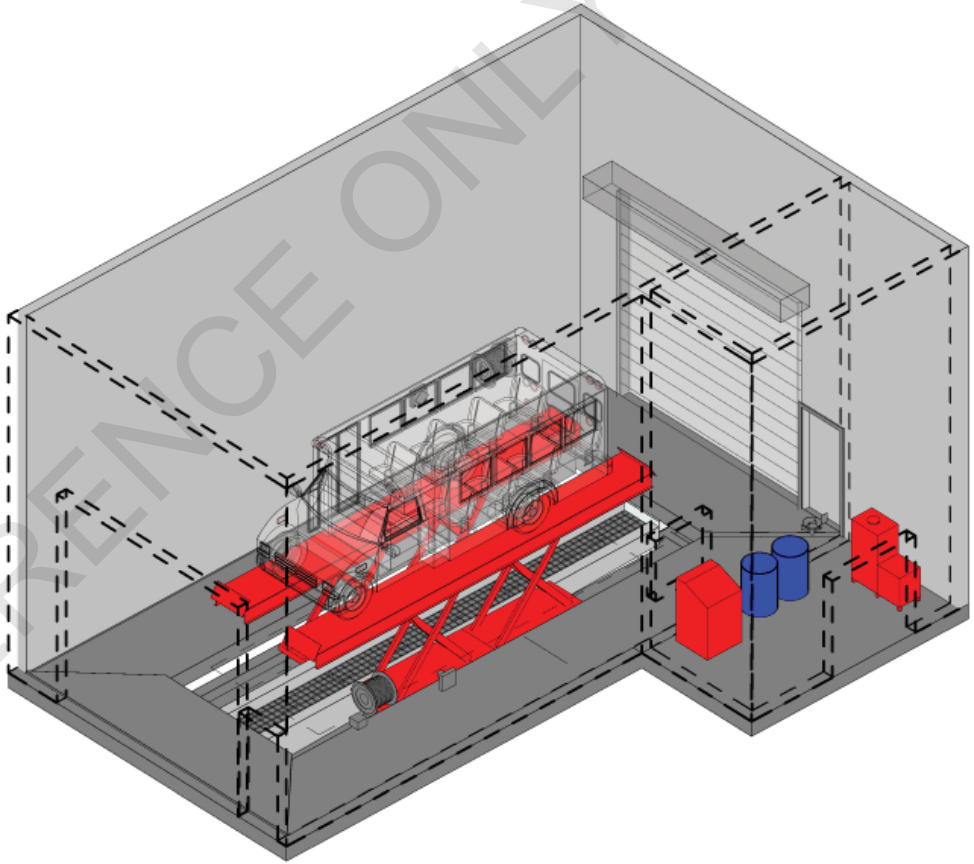
- Trench drain at overhead door with removable cover to central sediment and oil interceptor
- Lubrication reel bank (shared one per two bays)
- 3/4" water hose bibb with standard faucet at rear of bay 2'-0" AFF (one per three bays)
- Compressed air:
  - ✓ 2" compressed air piping loop (minimum)
  - ✓ Compressed air drops with cut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Lighting: LED lighting in accordance with IES recommendation minimum, 75 fc average, fixtures located to illuminate work spaces and around the vehicles
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide (four minimum) general purpose duplex receptacles on walls, columns, and between overhead doors
  - ✓ Dedicated computer receptacle, adjacent to data conduit on column adjacent to workbench
  - ✓ As required by equipment
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns at each bay

CHASSIS WASH BAY





CHASSIS WASH BAY

FUNCTION

Enclosed bay for washing of underside of paratransit vehicles before bringing into repair bays. Wash Equipment Room: A room adjacent to the Wash Bay for high pressure washer and soap drums

RELATIONSHIP TO OTHER AREAS

- Access to all other shop areas

RECOMMENDED CRITICAL DIMENSIONS

- 19'-0" vertical clearance
- 25'-0" wide x 40'-0" long

TYPICAL EQUIPMENT/FURNISHINGS

- Wand scabbard, wash controls, 50'-0" hose with reel
- Wash Equipment Room: High pressure washer and soap drum

TYPICAL DESIGN FEATURES

- Forklift access
- Natural Daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry with polyurea coatings treatment for wet and moisture protection
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities with light colored finish
- Doors:
  - ✓ Personnel doors with view panels to meet applicable code exit requirements
  - ✓ Exterior overhead door: Air operated, high lifting sectional, polycarbonate, 14'-0" x 14'-0", with view panels, automatic operator, interior and exterior push button controls and lockout on exterior
- Bollards on exterior jambs of overhead door (two each)

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structural grating over sump pit to accommodate H-20 loading
- Large grated sump with side drain for overflow
- Slope floor to trench drain and sump pit
- Structure as needed to support equipment

MECHANICAL CONSIDERATIONS

- Special ventilation to remove moisture, low air supply to eliminate steam
- Water resistant heating system
- In-floor radiant heating (if desired)
- As required by equipment
- Exhaust: Minimum 10 air changes per hour when wash equipment is activated. Minimum one air change per hour when wash equipment is inactive
- Heating set point: 55 degrees Fahrenheit

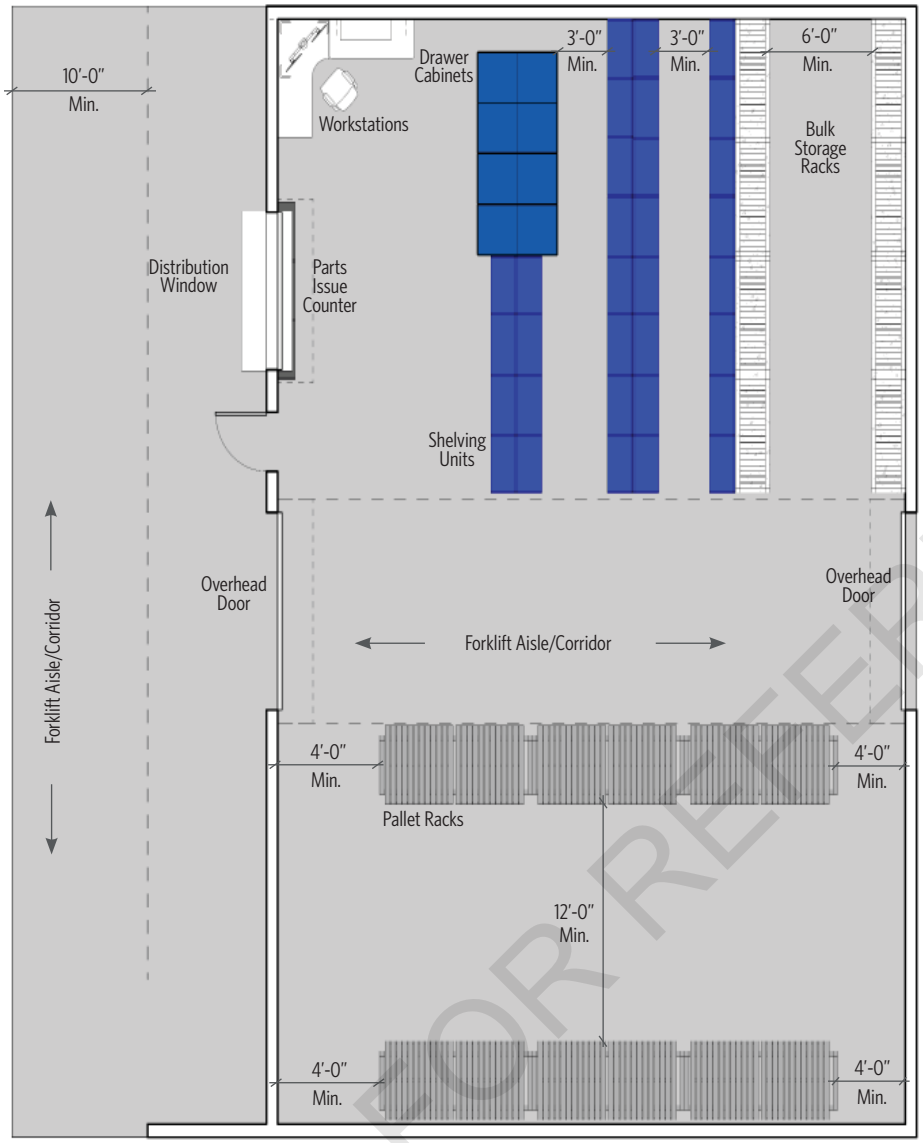
PLUMBING CONSIDERATIONS

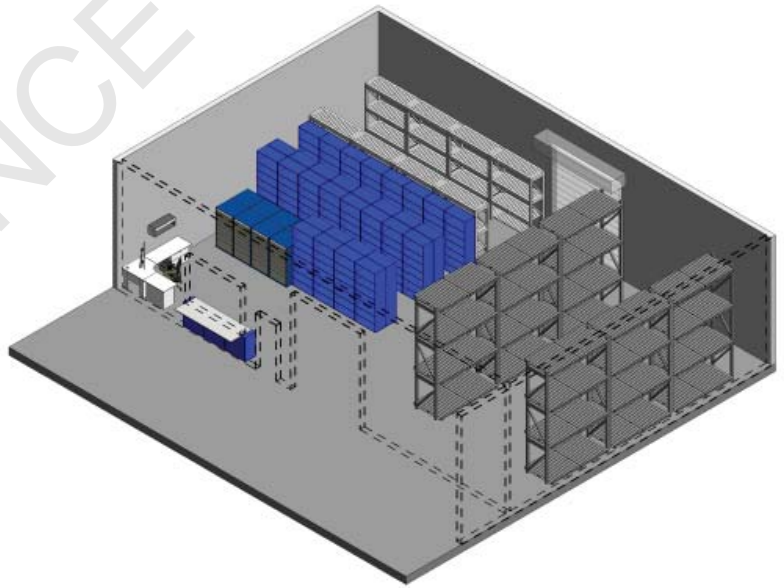
- Compressed air:
  - ✓ 2" compressed air piping loop (minimum)
  - ✓ As required by equipment
- Wash connections from high pressure washer to wand scabbard on both sides of bay
- Water connection to emergency eye wash/shower station
- Trench drain area (with removable cover) to central sediment and oil inceptor
- Large grated sump with side drain overflow to central sediment and oil inceptor
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Lighting: Sealed LED water tight lighting fixtures with no external reset device on walls, 20 fc average, fixtures located to illuminate work space and around vehicles
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide (four minimum) waterproof duplex receptacles on walls
- Communications: Paging/intercom system speakers

PARTS ROOM





PARTS ROOM

FUNCTION

Dedicated secure area for receiving, storage, and issuing of parts, material, and specialized tools

RELATIONSHIP TO OTHER AREAS

- Access to exterior for deliveries
- Access from Repair Bays and Shops

RECOMMENDED CRITICAL DIMENSIONS

- 12'-0" vertical clearance below mezzanine (min.)(if desired)
- 15'-0" vertical clearance above Mezzanine (min.)(if desired)
- 20'-0" clear for high bay pallet storage (min.)

TYPICAL EQUIPMENT/FURNISHINGS

- Shelves
- Bulk racks
- Pallet racks
- Cabinets
- High Density Drawer Units

TYPICAL DESIGN FEATURES

- Exterior access for deliveries
- Provide Issue Counter with stainless steel top and fire rated rolling overhead door
- Provide staging area for shipping/receiving with an overhead door to exterior of building
- Forklift access

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral non-metallic light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities with light colored finish
- Doors:
  - ✓ Personnel door with view panel to meet applicable code exit requirements
  - ✓ Exterior overhead door: High-lifting sectional, steel, insulated 10'-0" by 12'-0" with view panels, automatic operator, interior and exterior push button controls with lockout on exterior
  - ✓ Overhead door at Issue Window
  - ✓ Interior overhead door: coiling steel, 10'-0" by 12'-0", automatic operator, push controls, lockable

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accomodate in-floor radiant heat (if desired)
- Floor slab designed to accomodate forklift access

MECHANICAL CONSIDERATIONS

- Cooling set point: 75 degrees Fahrenheit
- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- In-floor radiant heat (if desired)
- As required by equipment

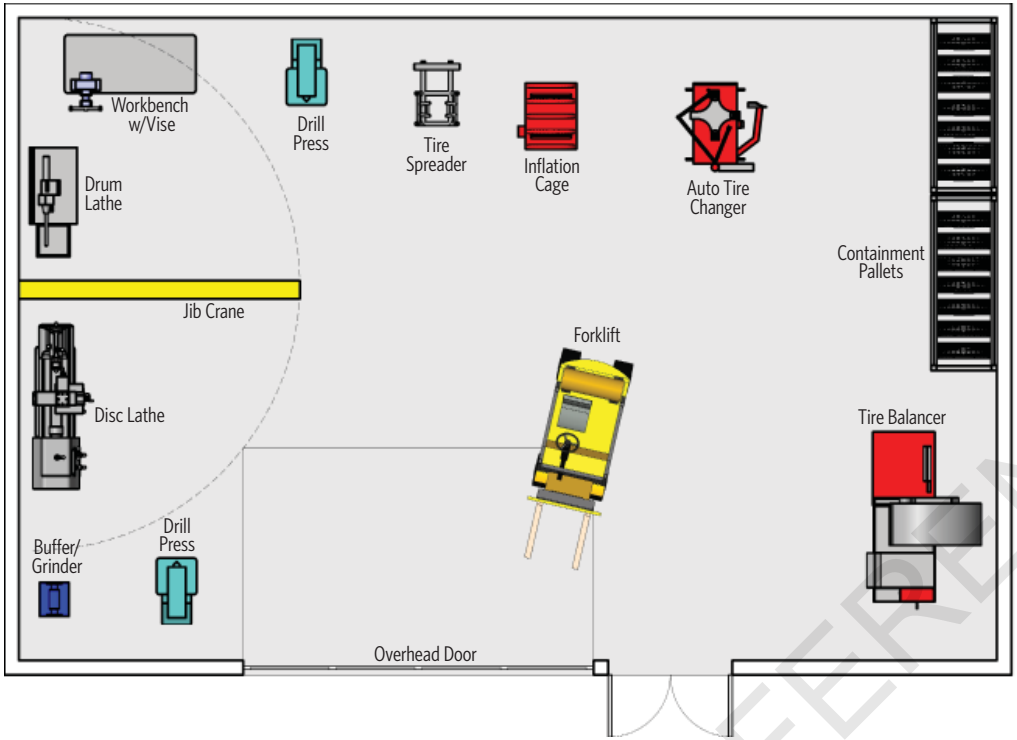
PLUMBING CONSIDERATIONS

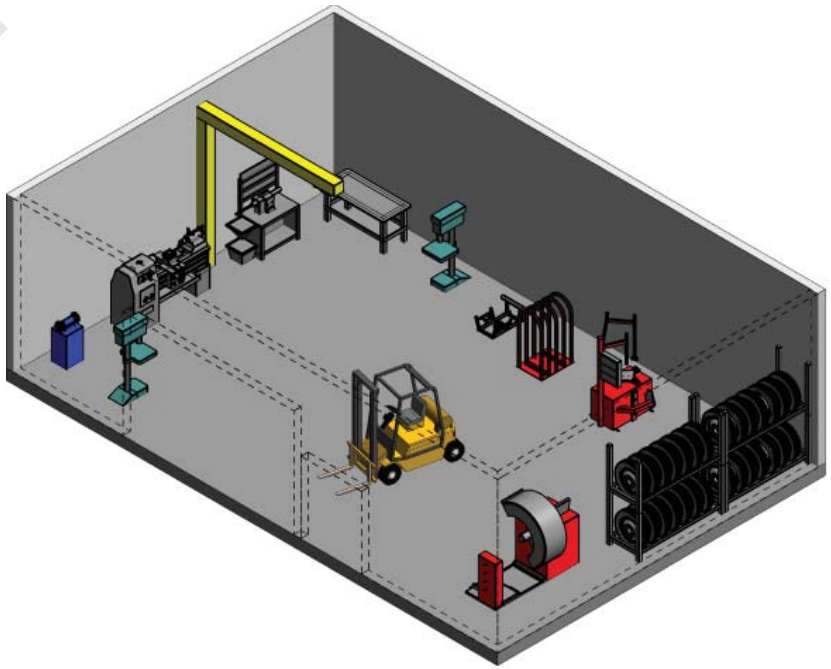
- Water: 3/4" water hose bibb with standard hose bibb at 2'-0" AFF
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Lighting: LED lighting in accordance with IES recommended lighting levels for Parts Window, Shipping/Receiving, and shopkeeper 35 fc average, Storage Area 20 fc average, fixtures located to illuminate work spaces
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide general purpose duplex receptacles on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

TIRE & BRAKE SHOP





TIRE & BRAKE SHOP

FUNCTION

Designated shop for repair of brake components, minor machining tasks and for turning brake drums. As well as repair, changing, balancing, and storage of tires.

RELATIONSHIP TO OTHER AREAS

- Access to Parts Room and Office areas
- Adjacent to Maintenance Bay

RECOMMENDED CRITICAL DIMENSIONS

- 12'-0" vertical clearance to structure and fixtures

TYPICAL EQUIPMENT/FURNISHINGS

- Severe use workbench with vise
- Brake lathes with dust collection system
- Jib crane
- Tire balancer
- Auto tire changer
- Tire spreader
- Drill press
- Buffer/grinder
- Disc lathes
- Containment pallets
- Inflatable chamber

TYPICAL DESIGN FEATURES

- Forklift access
- Physically separated from other areas to prevent migration of noise, dirt and fumes, if possible
- Electronically secure entry
- Natural Daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral non-metallic light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry Ceiling: Painted exposed structure, ductwork, conduit and utilities with light colored finish
- Doors:
  - ✓ Personnel doors with view panels to meet applicable code exit requirements
  - ✓ Overhead door (if desired): High-lifting sectional, steel, insulated, 10'-0" by 10'-0" with view panels, automatic operator, interior and exterior push button controls with lock out on exterior

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accomodate in-floor radiant heat (if desired)
- Floor slab designed to accomodate forklift access

MECHANICAL CONSIDERATIONS

- Mechanical: In-floor radiant heat (if desired)
  - ✓ Heating set point: 65 degrees Fahrenheit
  - ✓ General ventilation (per code)
  - ✓ Exhaust and makeup air for dust collection system
  - ✓ As required by equipment

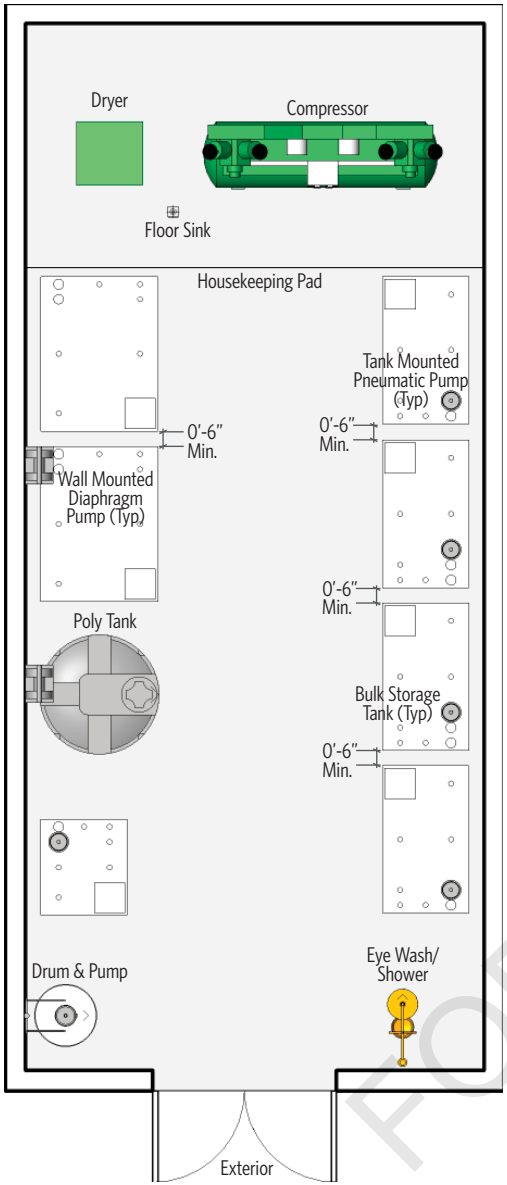
PLUMBING CONSIDERATIONS

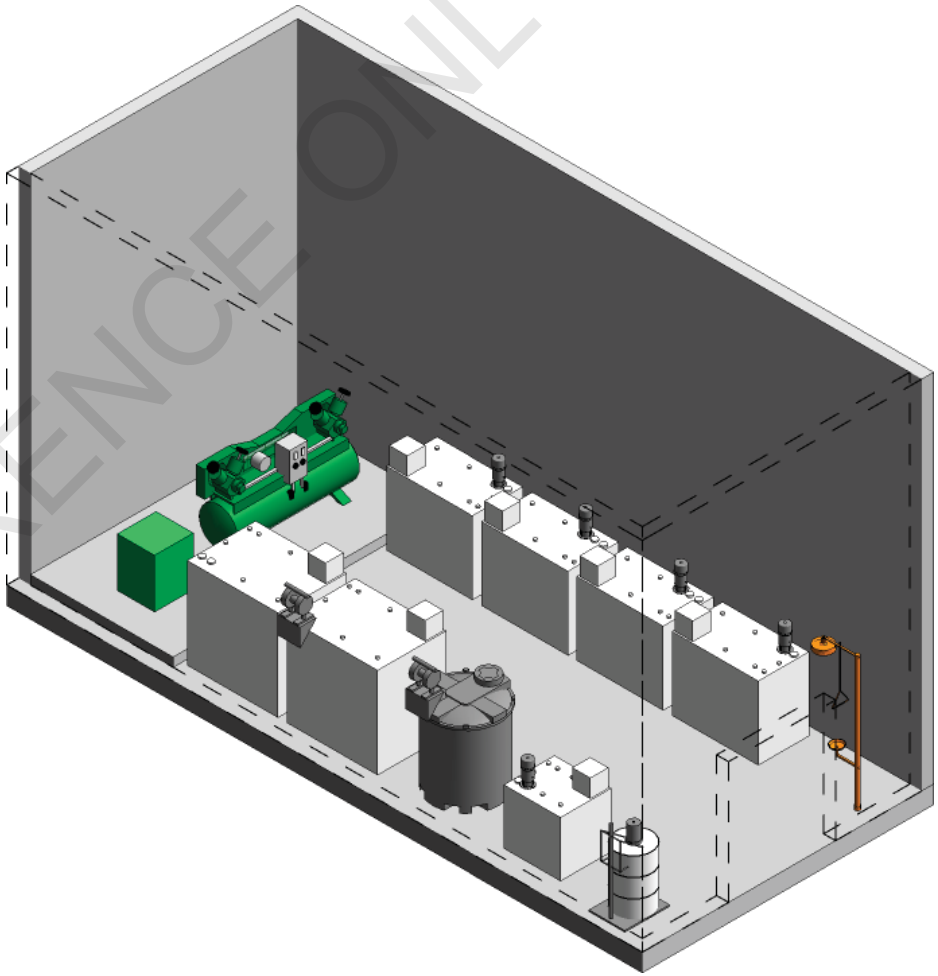
- Compressed air drop:
  - ✓ 2" compressed air piping loop (minimum)
  - ✓ Compressed air drops with cut-off valve, union separator, regulator with gauge, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- Water: 3/4" water hose bibb with standard hose bibb at 2'-0" AFF
- As required by equipment

ELECTRICAL CONSIDERATIONS

- Lighting: LED lighting in accordance with IES recommendation minimum, 50 fc average, fixtures located to illuminate work spaces and around the vehicles
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide (four minimum) general purpose duplex receptacles on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

FLUID & COMPRESSOR





FLUID & COMPRESSOR

FUNCTION

Enclosed room for storage and central distribution of lubricants. Space shall include a compressor(s) and refrigerated air dryer(s).

RELATIONSHIP TO OTHER AREAS

- Access to exterior for deliveries

RECOMMENDED CRITICAL DIMENSIONS

- 12'-0" vertical clearance to structure and fixtures

TYPICAL EQUIPMENT/FURNISHINGS

- Above grade fluid storage tanks, air piston and diaphragm pumps, drums, and a poly tank
- Air compressor
- Refrigerated air dryer

TYPICAL DESIGN FEATURES

- Exterior access for deliveries
- Acoustically and physically separated from other areas to prevent migration of noise, dirt, and fumes

ARCHITECTURAL CONSIDERATIONS

- Finishes:
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral non-metallic light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry sound absorption material
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish sound absorption material
- Doors:
  - ✓ Personnel door with view panel to meet applicable code exit requirements
  - ✓ Double 6'-0" wide door with interior exit device
  - ✓ No thresholds
- Acoustics: Determine based on equipment and location of adjacent spaces

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- 6" housekeeping pad for both the air compressor and refrigerated air dryer
- Structure as needed to support equipment
- Containment pit for 110% of largest tank (per local code)

MECHANICAL CONSIDERATIONS

- Mechanical:
  - ✓ Heating set point: 55 degrees Fahrenheit
  - ✓ Exhaust: Minimum 1.0 CFM per square foot
  - ✓ Negative pressurization
  - ✓ As required by equipment

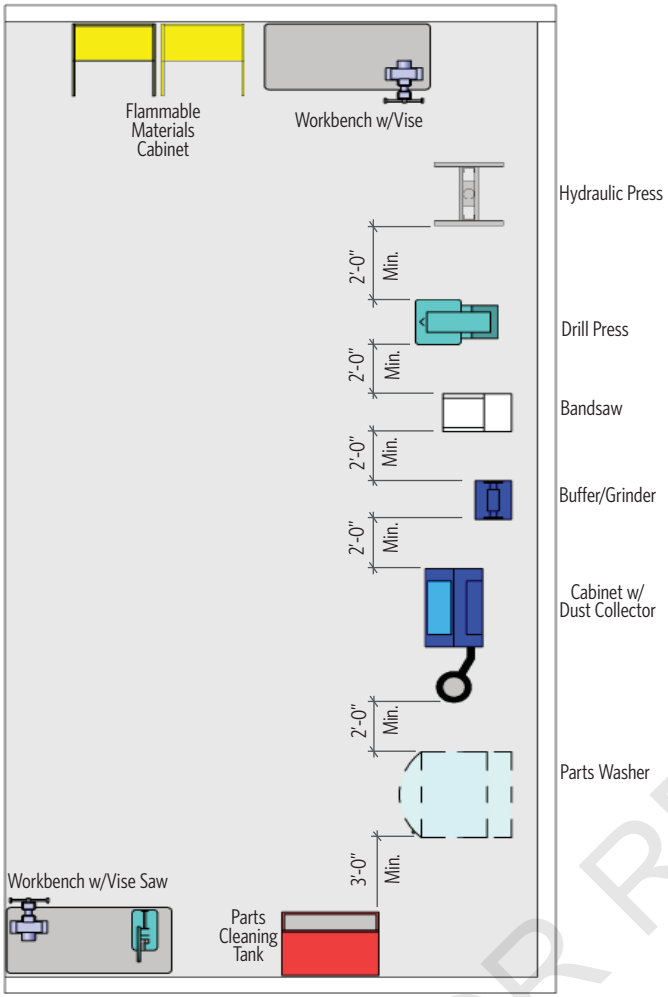
PLUMBING CONSIDERATIONS

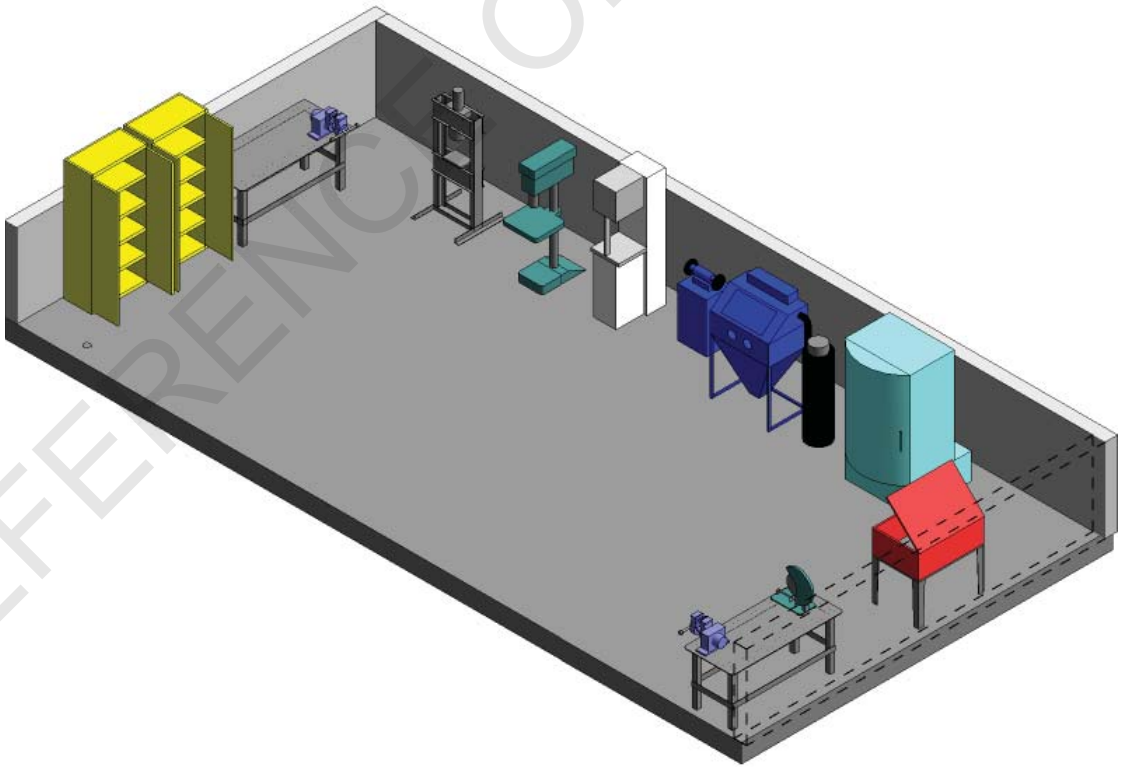
- Compressed air:
  - ✓ Duplex air compressor, air dryer, and air receiver
  - ✓ Floor sink between air compressor and dryer. Plumb to central sediment and oil interceptor
  - ✓ 2" compressed air piping loop (minimum) started in the Lube/Compressor Room
  - ✓ Compressed air line with 3/8" and 1/2" cut-off valve, separator, regulator with gauge, lubricator, and quick disconnect on wall at 4'-0" AFF
  - ✓ Connect to lubricant pumps
- Tank mount all piston lubricant pump(s)
- Wall mount all diaphragm pump(s)
- CG pump mounted to an air operated hoist (if required)
- Plumb tanks to corresponding lube reel banks located in the Repair Bays
- Plumb UO and UC tanks to corresponding pumps located in the Repair Bays (if required)
- 3/4" water hose bib with standard faucet 2'-0" AFF
- Emergency eyewash

ELECTRICAL CONSIDERATIONS

- Lighting: LED lighting in accordance with IES recommendation minimum, 25 fc average, fixtures located to illuminate work spaces
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide (four minimum) general purpose duplex receptacles on walls
  - ✓ Lube/Compressor: 25 fc
  - ✓ As required by equipment

EQUIPMENT & SUPPORT





EQUIPMENT & SUPPORT

FUNCTION

Designated area for common fixed shop equipment which supports all repair bays and associated shop areas

RELATIONSHIP TO OTHER AREAS

- Access from Maintenance office areas
- Adjacent to Repair Bays, Parts Room, and Portable Equipment Storage

RECOMMENDED CRITICAL DIMENSIONS

- 12'-0" to vertical clearance to structure and fixtures

TYPICAL EQUIPMENT/FURNISHINGS

- Severe use workbench(es) with vise
- Buffer grinder with dust collector
- Hydraulic press
- Drill press
- Abrasive blast cabinet
- Horizontal bandsaw
- Cut-off saw
- Parts washer

TYPICAL DESIGN FEATURES

- Half-height 54" walls on 3 sides for utilities and to prevent blocking vision of shop from office areas and repair bays
- Forklift access
- Natural Daylighting desired

ARCHITECTURAL CONSIDERATIONS

- Finishes
  - ✓ Floor: Soil, grease, water, slip resistant concrete with integral non-metallic light reflective hardener, and chemical bonded concrete sealer
  - ✓ Walls: Soil and grease resistant, light colored finished concrete or masonry
  - ✓ Ceiling: Painted exposed structure, ductwork, conduit and utilities, light colored finish
- Doors: None

STRUCTURAL CONSIDERATIONS

- Control joints in floor slab at adequate spacing
- Structure as needed to support equipment
- Floor slab designed to accomodate in-floor radiant heat (if desired)
- Floor slab designed to accomodate forklift access

MECHANICAL CONSIDERATIONS

- Heating set point: 65 degrees Fahrenheit
- General ventilation (per code)
- In-floor radiant heat (if desired)
- As required by equipment

PLUMBING CONSIDERATIONS

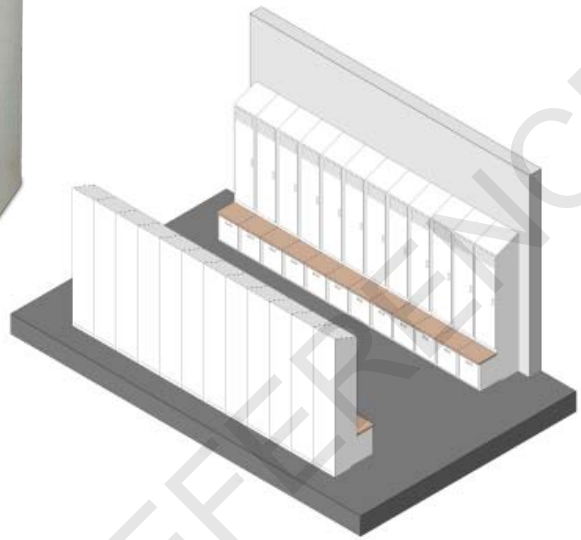
- Compressed air drop:
  - ✓ 2" compressed air piping loop (minimum)
  - ✓ Compressed air drops with cut-off valve, union separator, regulator with gauge, lubricator, and quick disconnects on 4'-0" AFF
  - ✓ Provide disconnects for 3/8" and 1/2" impact tools at locations to be determined during detailed design
  - ✓ As required by equipment
- Water: 3/4" water hose bibb with standard hose bibb at 2'-0" AFF
- As required by equipment

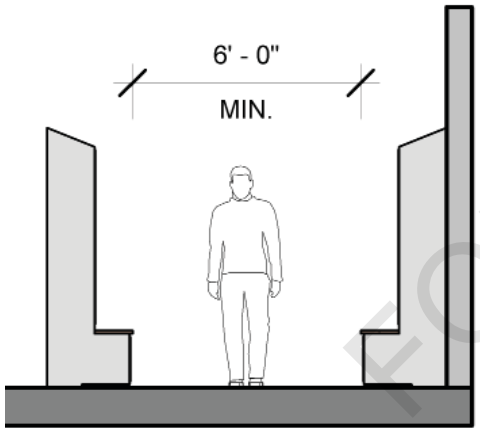
ELECTRICAL CONSIDERATIONS

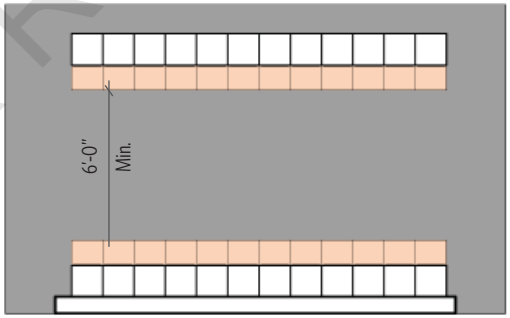
- Lighting: LED lighting in accordance with IES recommendation minimum, 50 fc average, fixtures located to illuminate work spaces
- Power:
  - ✓ All receptacles and outlets at 3'-6" AFF
  - ✓ Provide (ten minimum) general purpose duplex receptacles on walls and columns
  - ✓ Dedicated computer receptacle, adjacent to data conduit on wall or column
  - ✓ As required by equipment
- Communications:
  - ✓ Paging/intercom system speakers
  - ✓ Data conduit on columns and/or walls

MAINTENANCE

MEN'S & WOMEN'S LOCKERS







FUNCTION

Locker area for each male and female Bus Maintenance employee.

RELATIONSHIP TO OTHER AREAS

- Access by Repair and Shop Areas
- Located within each Men and Women Restrooms

RECOMMENDED CRITICAL DIMENSIONS

- 9'- 0" vertical clearance (minimum)

TYPICAL EQUIPMENT/FURNISHINGS

- 6-foot high gear, well-ventilated lockers with built-in bench

TYPICAL DESIGN FEATURES

- Flooring: Tile covering or finished concrete (recommended)
- Walls: Tile covering or painted masonry (recommended)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
- Doors: Single leaf 3'-0" door
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating, ventilation, and exhaust (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (15 fc average)
  - ✓ Provide (six minimum) general purpose duplex receptacles
- Lighting Control:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

OPERATIONS

GENERAL OFFICE MODULES

General Manager	Assistant General Manager	HR Manager	Administrative Assistant
• Reference Office Module Private Office - 224 SF • Adjacent to Assistant General Manager	• Reference Office Module Private Office - 120 SF • Adjacent to General Manager	• Reference Office Module Private Office - 120 SF • Access to Copy/Supply	• Reference Office Module Workstation - 48 SF • Adjacent to General Manager and Assistant General Manager

Safety Manager	FTA or SFMTA Monitor	Counting & Payroll	Group Van Dispatch
• Reference Office Module Private Office - 120 SF • Access to Copy/Supply	• Reference Office Module Shared Office - 120 SF • Access to Copy/File	• Reference Office Module Shared Office - 120 SF • Access to Copy/File	• Reference Office Module Workstation - 64 SF • Located within Open Office Space for Dispatch

GENERAL OFFICE MODULES

Scheduling, Group Van, & Administration

- Reference Office Module Workstation - 64 SF
- Located within Open Office Space for Dispatch

Field Supervisor

- Reference Office Module Workstation - 64 SF
- Located within Open Office Space

Trainers

- Reference Office Module Workstation - 64 SF
- Located within Open Office Space

Dispatch Supervisor

- Reference Office Module Private Office - 120 SF
- Adjacent to Dispatch

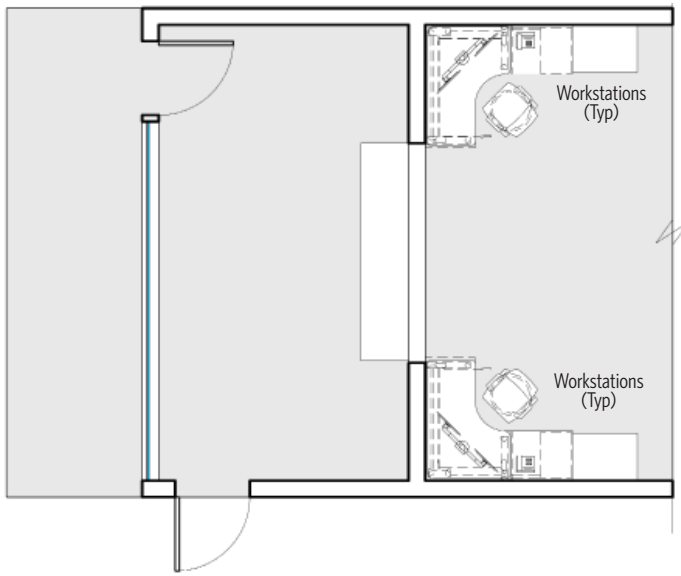
Dispatch

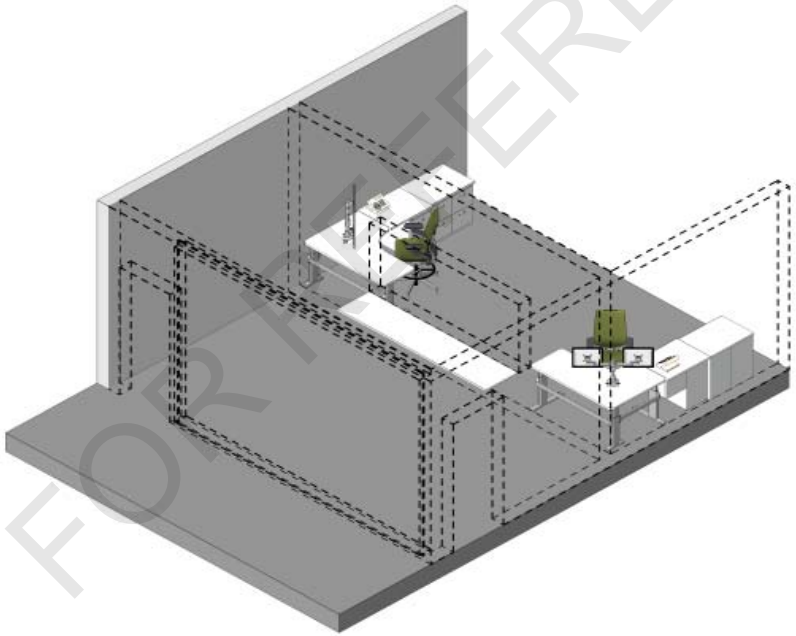
- Reference Office Module Workstation - 64 SF
- Located within Open Office Space for Dispatch

Call Center

- Reference Office Module Workstation - 36 SF
- Located within Open Office Space for Dispatch

DISPATCH WINDOW





FUNCTION

Area for Operators to report, receive information, and write reports

RELATIONSHIP TO OTHER AREAS

- Adjacent to Driver Ready Room
- Adjacent to Dispatch

RECOMMENDED CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

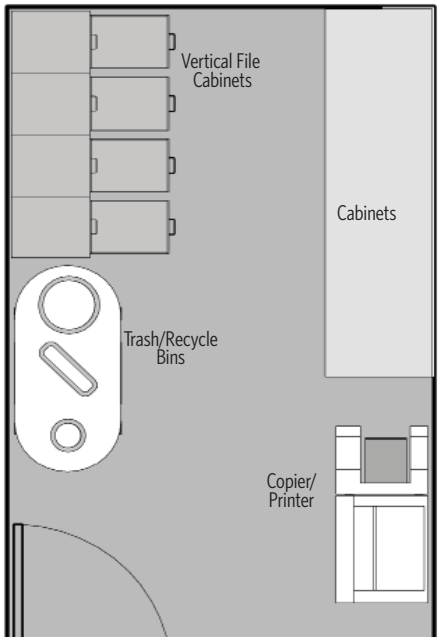
TYPICAL EQUIPMENT/FURNISHINGS

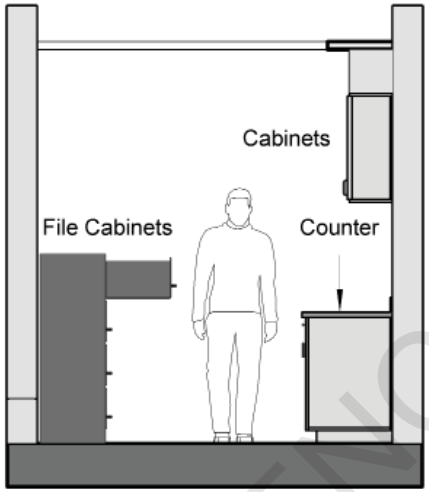
- Computer workstations
- Bulletin board
- Counter

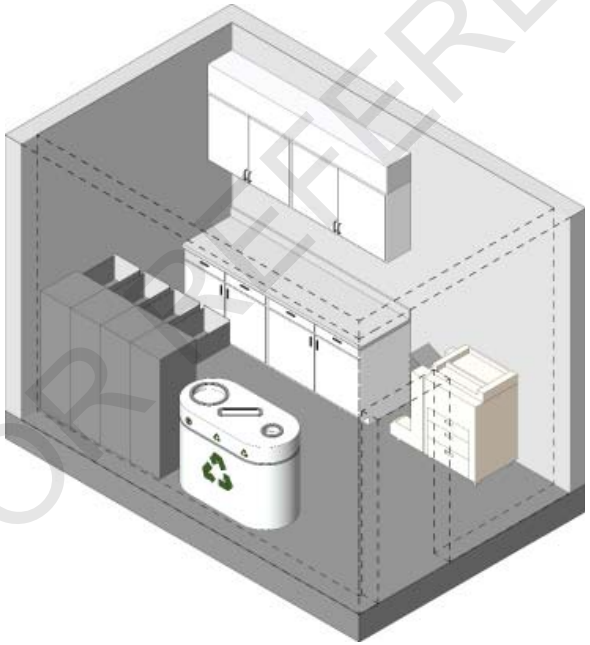
TYPICAL DESIGN FEATURES

- Flooring:
  - ✓ Resilient floor covering with base or finished concrete (recommended)
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED lighting in accordance with IES recommendation (20 fc of indirect lighting average) (no glare)
  - ✓ Provide (three minimum) general purpose duplex receptacles
- Lighting Control:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

COPY/SUPPLY







FUNCTION

Dedicated alcove or room for copier/printer/scanner/fax machine, storage for office supplies, and work surface

RELATIONSHIP TO OTHER AREAS

- Access to all office areas

RECOMMENDED CRITICAL DIMENSIONS

- 9′-0″ vertical clearance (minimum)

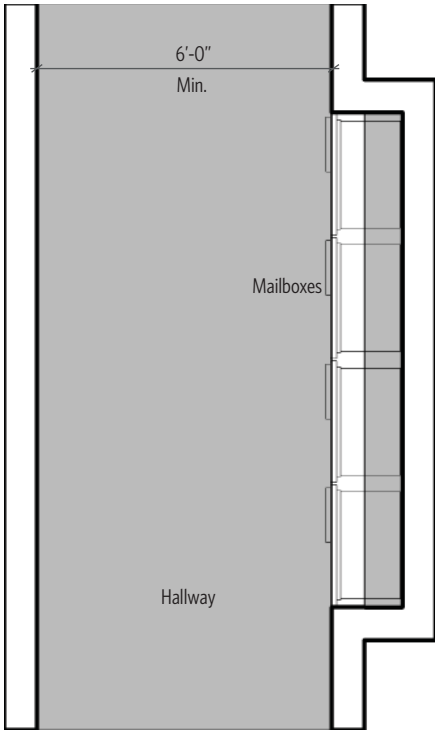
TYPICAL EQUIPMENT/FURNISHINGS

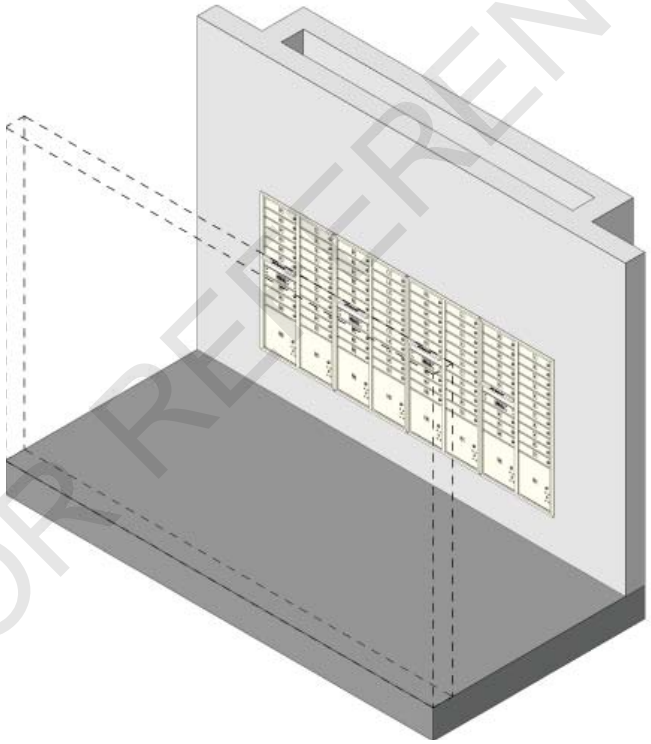
- Copier/printer/scanner/fax machine
- Work surface with cabinets below and above
- Filing cabinets

TYPICAL DESIGN FEATURES

- Flooring: Resilant floor covering with base or finished concrete
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Doors: Single leaf 3′-0″ door with lockable lever set hardware (recommended)
  - ✓ Electronically secured entry (as required)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide (six minimum) general purpose duplex receptacles
  - ✓ Provide one data outlet with four data ports
  - ✓ Provide box conduit rough-ins to three other locations in the room
- Lighting Control:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

MAILBOX ALCOVE





FUNCTION

Alcove area for staff and Post Man to drop off and pick up mail.

RELATIONSHIP TO OTHER AREAS

- Access to all office areas

RECOMMENDED CRITICAL DIMENSIONS

- 9' -0" vertical clearance (minimum)

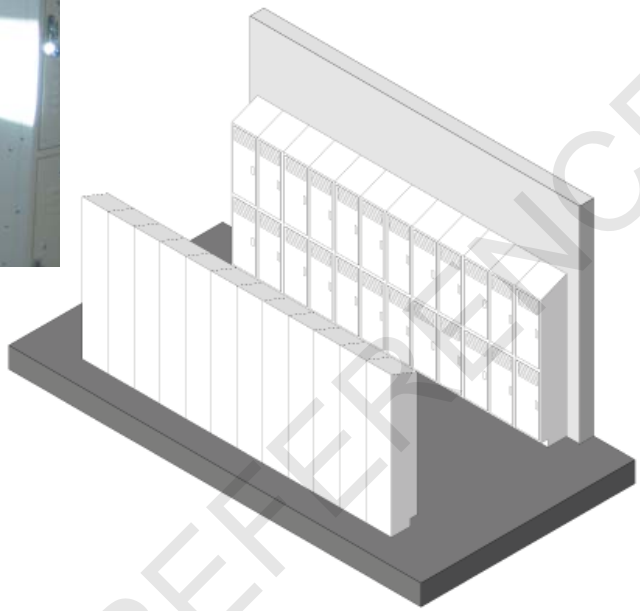
TYPICAL EQUIPMENT/FURNISHINGS

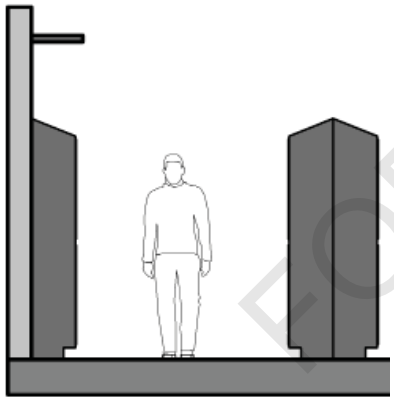
- Mailboxes

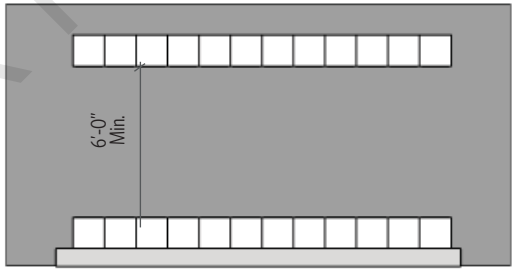
TYPICAL DESIGN FEATURES

- Flooring: Resilant floor covering with base or finished concrete
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Doors: Single leaf 3'-0" door with lockable lever set hardware (recommended)
  - ✓ Electronically secured entry (as required)
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide (six minimum) general purpose duplex receptacles
  - ✓ Provide one data outlet with four data ports
  - ✓ Provide box conduit rough-ins to three other locations in the room
- Lighting Control:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

DISPATCH/CALL CENTER LOCKER ALCOVE







FUNCTION

Alcove for the Operators to store personal gear and clothing in half-height lockers. Co-ed locker area, changing area in respective restrooms.

RELATIONSHIP TO OTHER AREAS

- Connected to Gilley Room
- Adjacent to Restroom/Showers

RECOMMENDED CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

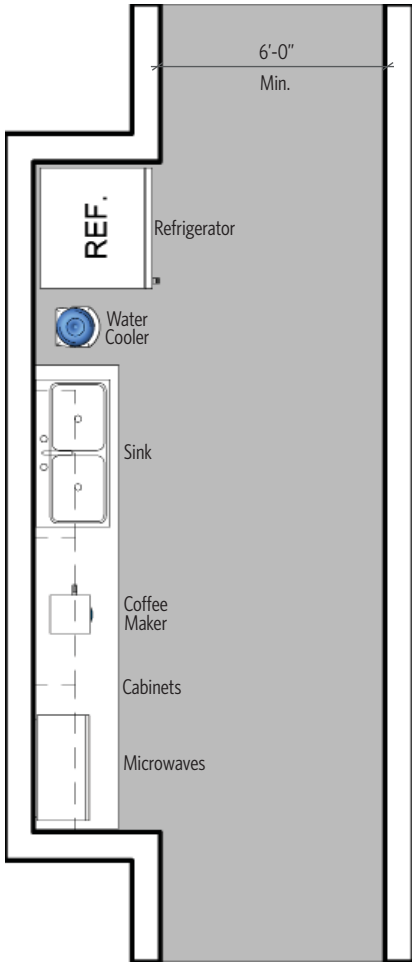
TYPICAL EQUIPMENT/FURNISHINGS

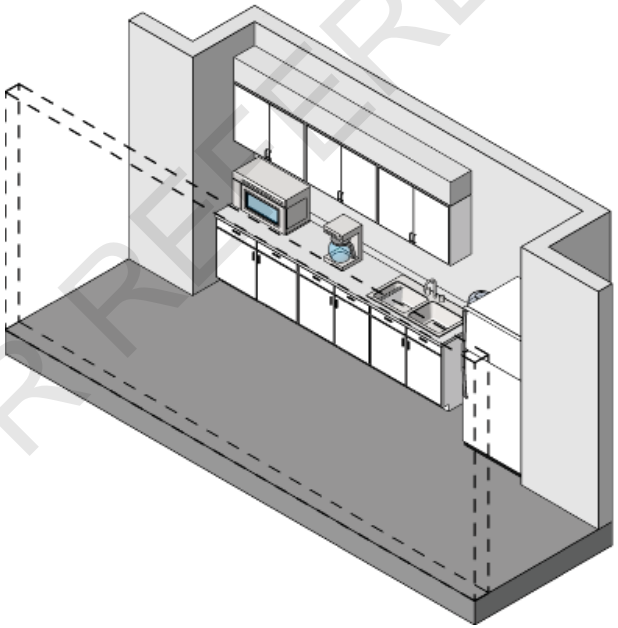
- Heavy duty, two tier, 3-foot, well-ventilated, half-height lockers; one each per Operator assigned to the facility

TYPICAL DESIGN FEATURES

- Flooring:
  - ✓ Tile covering or finished concrete (recommended)
- Walls: Tile covering or painted masonry (recommended)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
- Doors: Single leaf 3'-0" door
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating, ventilation, and exhaust (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide (six minimum) general purpose duplex receptacles
- Lighting Control:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

OFFICE COFFEE ALCOVE





FUNCTION

Alcove for coffee to be stored

RELATIONSHIP TO OTHER AREAS

- Centrally located
- Access to all office areas, repair areas, and Restrooms

RECOMMENDED CRITICAL DIMENSIONS

- 9' -0" vertical clearance (minimum)

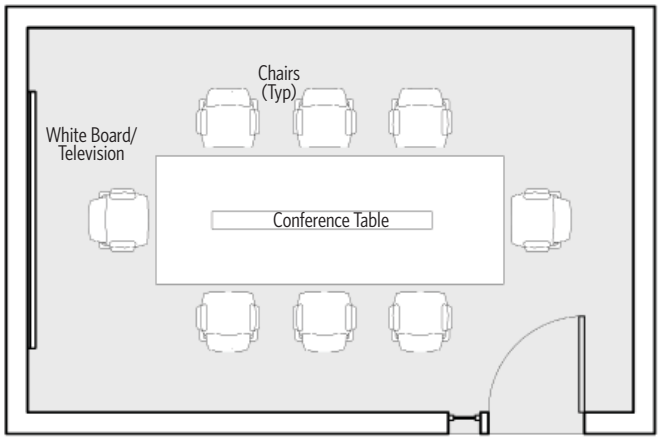
TYPICAL EQUIPMENT/FURNISHINGS

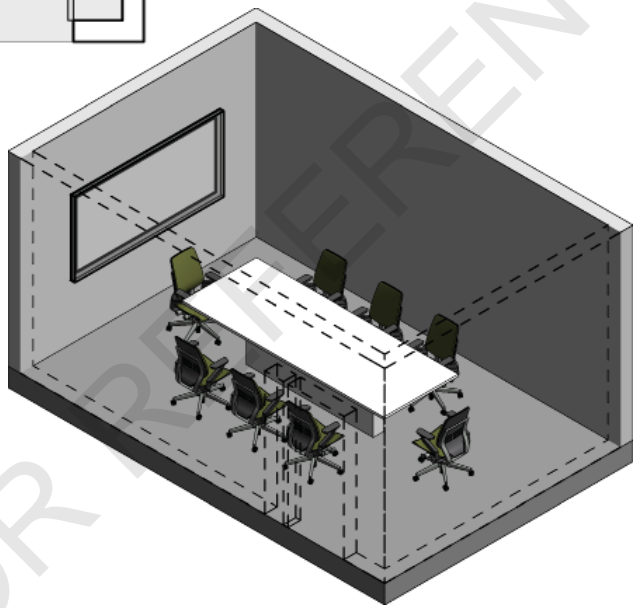
- Counter space, upper and lower cabinets, sink, microwaves, refrigerator, coffee maker, water filter, and water cooler

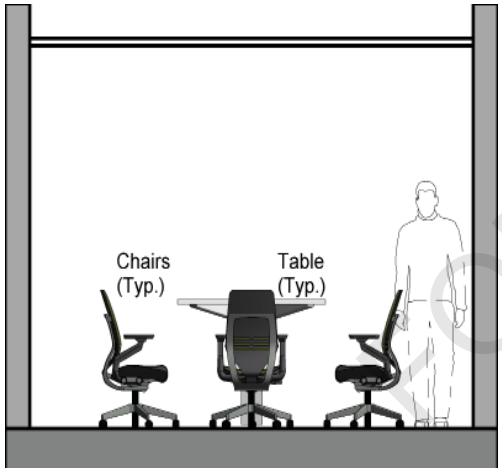
TYPICAL DESIGN FEATURES

- Furniture: Use owner furniture standards (if applicable)
- Flooring:
  - ✓ Resilient floor covering with base or finished concrete (recommended)
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Doors: Single leaf 3'-0" doors (two minimum) with lockable lever set hardware (recommended)
  - ✓ Electronically secured entry (as required)
- Daylighting: Exterior window desired
- Plumbing: rough in for equipment
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Provide CO2 detection
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide (six minimum) general purpose duplex receptacles
  - ✓ Provide data outlets with four data ports (two minimum)
- Lighting Control:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

CONFERENCE ROOM







FUNCTION

Room for up to a ten person meeting.

RELATIONSHIP TO OTHER AREAS

- Accessible from all departments in the building

RECOMMENDED CRITICAL DIMENSIONS

- 9′-0″ vertical clearance (minimum)

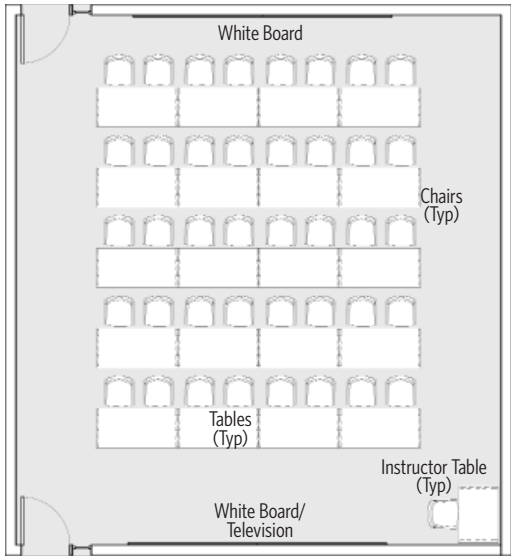
TYPICAL EQUIPMENT/FURNISHINGS

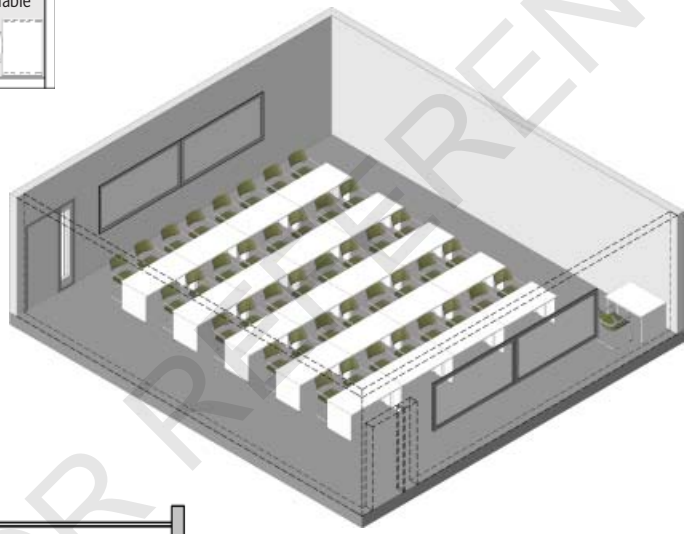
- Table
- Chairs
- White board/Television

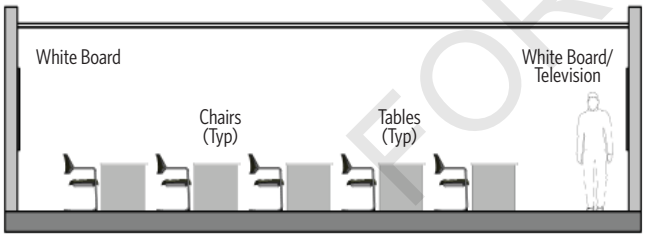
TYPICAL DESIGN FEATURES

- Furniture: Use owner furniture standards (if applicable)
- Flooring:
  - ✓ Carpet tile floor with rubber base or resilient floor covering with base (recommended)
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Doors: Single leaf 3′-0″ door with lockable lever set hardware (recommended)
  - ✓ Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED lighting in accordance with IES recommendations (30 fc average)
  - ✓ Provide (four minimum) general purpose duplex receptacles and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and conduit rough-ins to three other locations in the room
- Lighting Control:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

TRAINING ROOM







FUNCTION

Room for up to a 40 person meeting or training

RELATIONSHIP TO OTHER AREAS

- Accessible from all departments in the building

RECOMMENDED CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

TYPICAL EQUIPMENT/FURNISHINGS

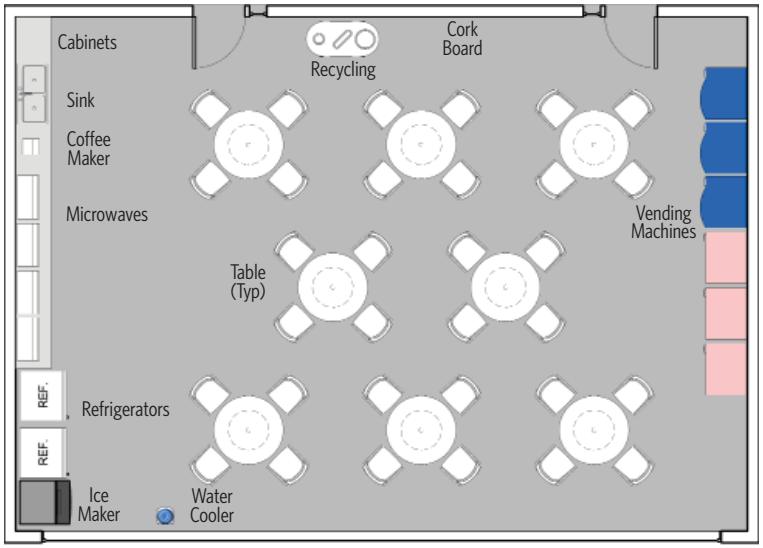
- Mayline Cohere Flip/nest table 60" by 30" laminate
- Cool mesh nesting chairs
- White board/Television

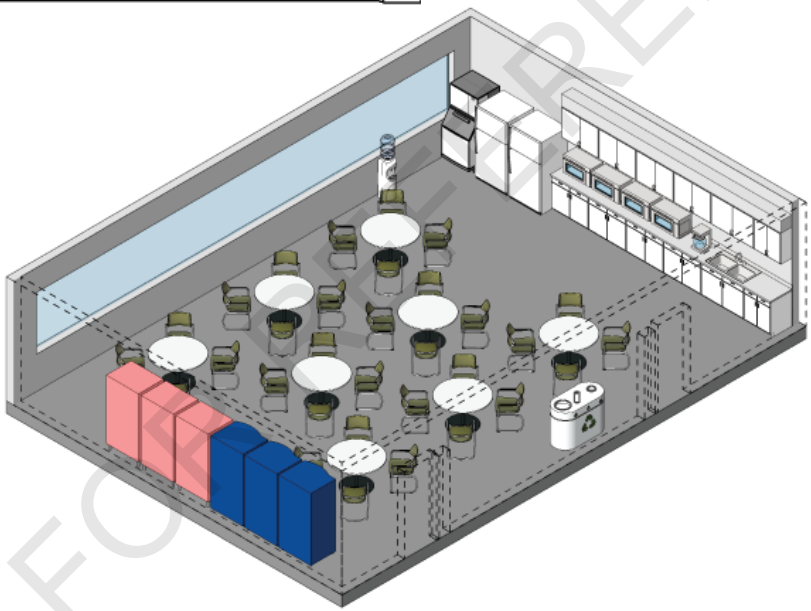
TYPICAL DESIGN FEATURES

- Furniture: Use owner furniture standards (if applicable)
- Flooring:
  - ✓ Carpet tile floor with rubber base or resilient floor covering with base (recommended)
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Doors: Single leaf 3'-0" doors with lockable lever set hardware (recommended)
  - ✓ Electronically secured entry (as required)
- Daylighting: Exterior window or vision glass desired
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED lighting in accordance with IES recommendations (30 fc average)
  - ✓ Provide (four minimum) general purpose duplex receptacles and a guard receptacle in the floor under the middle of the table
  - ✓ Provide one data outlet with four data ports in the floor under the middle of the table
  - ✓ Provide box and conduit rough-ins to three other locations in the room
- Lighting Control:
  - ✓ Dimmable, indirect lighting with vacancy sensor
  - ✓ Task lighting (recommended)

- White bo

DRIVER READY ROOM/KITCHENETTE





FUNCTION

Enclosed room used as a break area for staff.

RELATIONSHIP TO OTHER AREAS

- Centrally located
- Access to all office areas, repair areas, and Restrooms

RECOMMENDED CRITICAL DIMENSIONS

- 9′ -0″ vertical clearance (minimum)

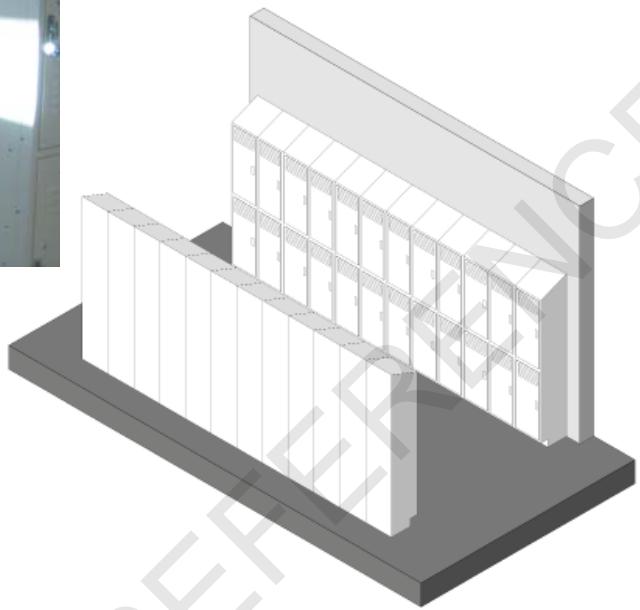
TYPICAL EQUIPMENT/FURNISHINGS

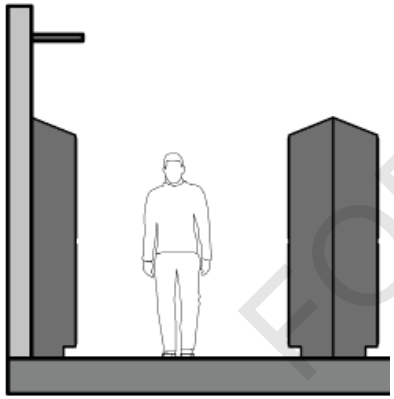
- Counter space, upper and lower cabinets, sink, microwave, refrigerators, coffee maker, ice maker, water filter, vending machines, water coolers, tables, chairs, trash/recycling/compost bins

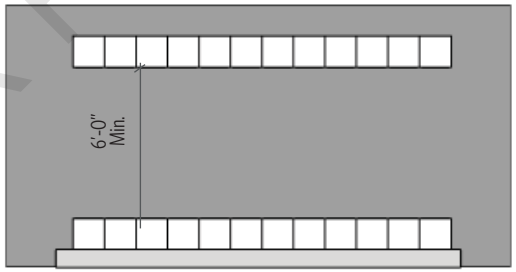
TYPICAL DESIGN FEATURES

- Furniture: Use owner furniture standards (if applicable)
- Flooring:
  - ✓ Resilient floor covering with base or finished concrete (recommended)
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Doors: Single leaf 3′-0″ doors (two minimum) with lockable lever set hardware (recommended)
  - ✓ Electronically secured entry (as required)
- Daylighting: Exterior window desired
- Plumbing: rough in for equipment
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
  - ✓ Provide CO2 detection
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide (six minimum) general purpose duplex receptacles
  - ✓ Provide data outlets with four data ports (two minimum)
- Lighting Control:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

DRIVER MEN'S & WOMEN'S LOCKERS







FUNCTION

Alcove for the Operators to store personal gear and clothing in half-height lockers. Co-ed locker area, changing area in respective restrooms.

RELATIONSHIP TO OTHER AREAS

- Connected to Gilley Room
- Adjacent to Restroom/Showers

RECOMMENDED CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

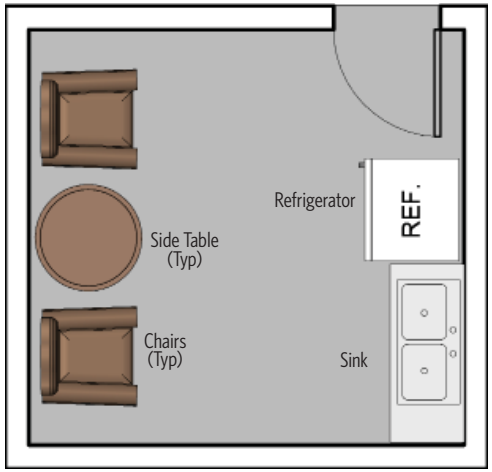
TYPICAL EQUIPMENT/FURNISHINGS

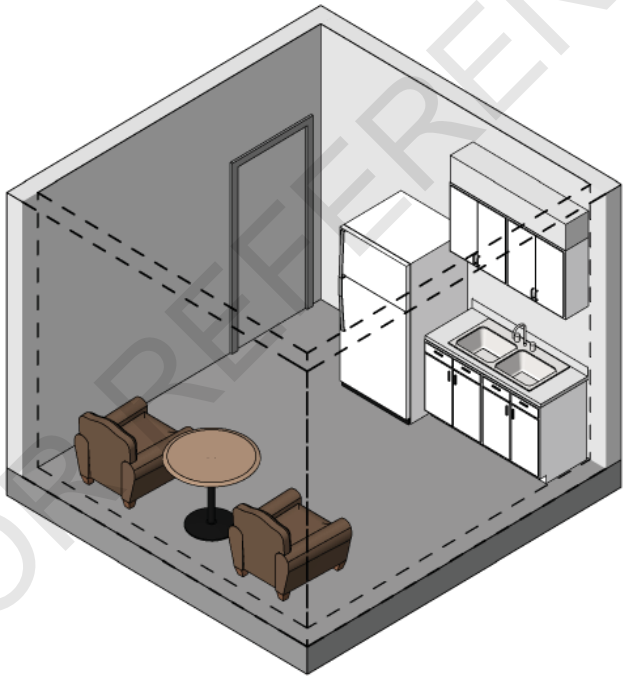
- Heavy duty, two tier, 3-foot, well-ventilated, half-height lockers; one each per Operator assigned to the facility

TYPICAL DESIGN FEATURES

- Flooring:
  - ✓ Tile covering or finished concrete (recommended)
- Walls: Tile covering or painted masonry (recommended)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile or painted exposed structure (recommended)
- Doors: Single leaf 3'-0" door
- Mechanical:
  - ✓ Provide appropriate balanced cooling, heating, ventilation, and exhaust (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED Lighting in accordance with IES recommendation (20 fc average)
  - ✓ Provide (six minimum) general purpose duplex receptacles
- Lighting Control:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

LACTATION ROOM





FUNCTION

Dedicated room for privacy to take care of personal matter and storage of first aid supplies.

RELATIONSHIP TO OTHER AREAS

- Accessible from department office areas

RECOMMENDED CRITICAL DIMENSIONS

- 9'-0" vertical clearance (minimum)

TYPICAL EQUIPMENT/FURNISHINGS

- Chairs
- Sink with countertops and cabinets
- Secure storage for equipment and supplies
- Side tables
- Refrigerator

TYPICAL DESIGN FEATURES

- Flooring:
  - ✓ Resilient floor covering with base or finished concrete (recommended)
- Walls:
  - ✓ Gypsum board on metal studs (typical) with wall finishes or painted masonry (optional gypsum board furring)
  - ✓ Wall protection as needed
- Ceiling: Acoustical ceiling tile (recommended)
- Doors: Single leaf 3'-0" door with lockable lever set hardware (recommended)
  - ✓ Electronically secured entry (as required)
- Plumbing: Rough-in for fixtures
- Mechanical:
  - ✓ Provide appropriate, balanced cooling, heating, and ventilation (per code)
  - ✓ Heating set point: 68 degrees Fahrenheit
  - ✓ Cooling set point: 74 degrees Fahrenheit
- Electrical:
  - ✓ LED lighting in accordance with IES recommendation (20 fc indirect lighting average)
  - ✓ Provide (three minimum) general purpose duplex receptacles
- Lighting Control:
  - ✓ Dimmable, indirect lighting with occupancy sensor
  - ✓ Task lighting (recommended)

APPENDIX H:
PG&E SYSTEM IMPACT STUDY REPORT FOR MIXED USE SERVICE APPLICATION (FOR REFERENCE)

System Impact Study Report

Load Interconnection

WDT – City & County of San Francisco

2500 Mariposa St (Mix), San Francisco, CA 94110

Pacific Gas and Electric Company®

February 6, 2023

Table of Contents

Introduction

SFPUC has submitted a request to Pacific Gas & Electric Co for a new primary electric service located on 2500 Mariposa St (Mix), San Francisco. The requested maximum net three phase electrical load demand for this service is estimated to be 7.8 MW. The customer's proposed Commercial Operation Date (COD) is Q3 2023.

The System Impact Study (SIS) will analyze the:

1. Request by SFPUC to interconnect a new electrical load demand of 7.8 MW.
2. System reinforcements necessary to mitigate the adverse impacts of the new load.
3. Facilities required for system reinforcements with a non-binding good faith estimate of cost responsibility and a non-binding good faith estimated time to construct.

This SIS will form the basis by defining the scope, content, assumptions, and terms of reference.

The SIS assumes no additional generation, renewables or otherwise, will be installed at the site. Should SFPUC wish to install generation, renewable or otherwise, at the site in the future, an application is required pursuant to the WDT.

Project and Interconnection Information

Table 1 below lists the general information about the Project as provided by the Customer.

Table 1: Project General Information

Project Location	2500 Mariposa St (Mix)
PG&E Planning Area	San Francisco
Maximum Load	7.80 MW
Power Factor	The Distribution Provider's initially required corrected Power Factor (Section 20.4 of Tariff and Section 13.3 of this Service Agreement) will be as follows. Peak Load PF 95% @ 12:00 PM to 6:00 PM: ± 0.01 Minimum Load PF 95% @ 6:01 PM to 11:59 AM: ±0.02
Connection Voltage	12 kV
Primary Service Entrance	PG&E approved Phase and Ground protection

Figure 1: Location of Facility

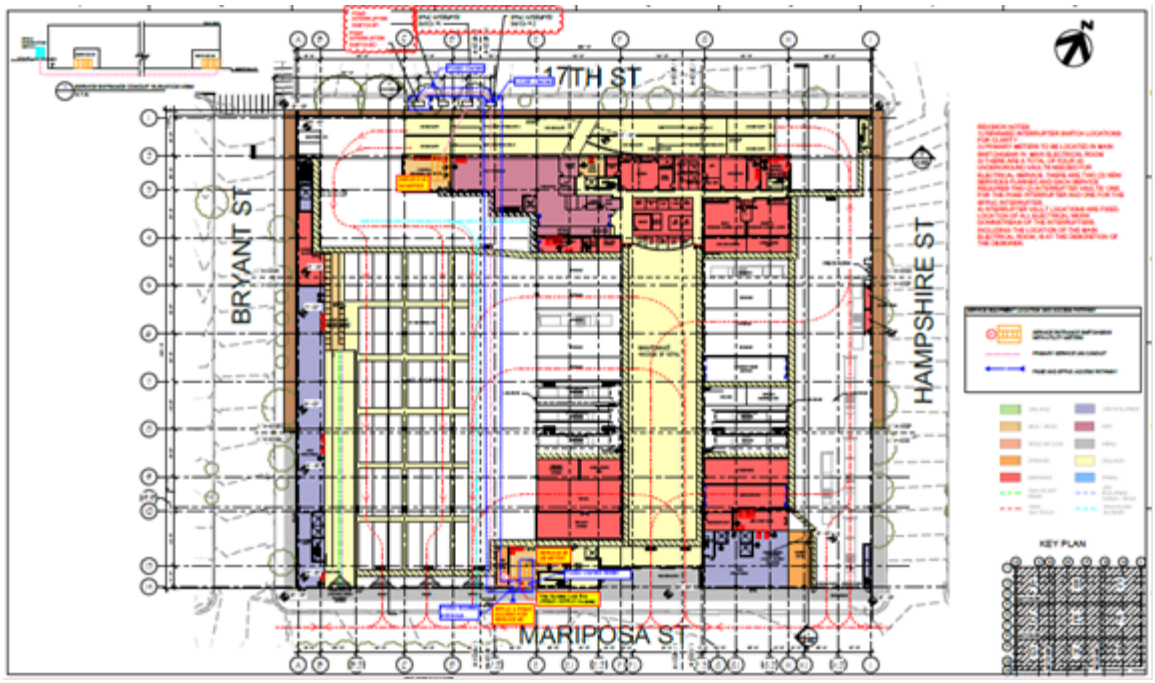
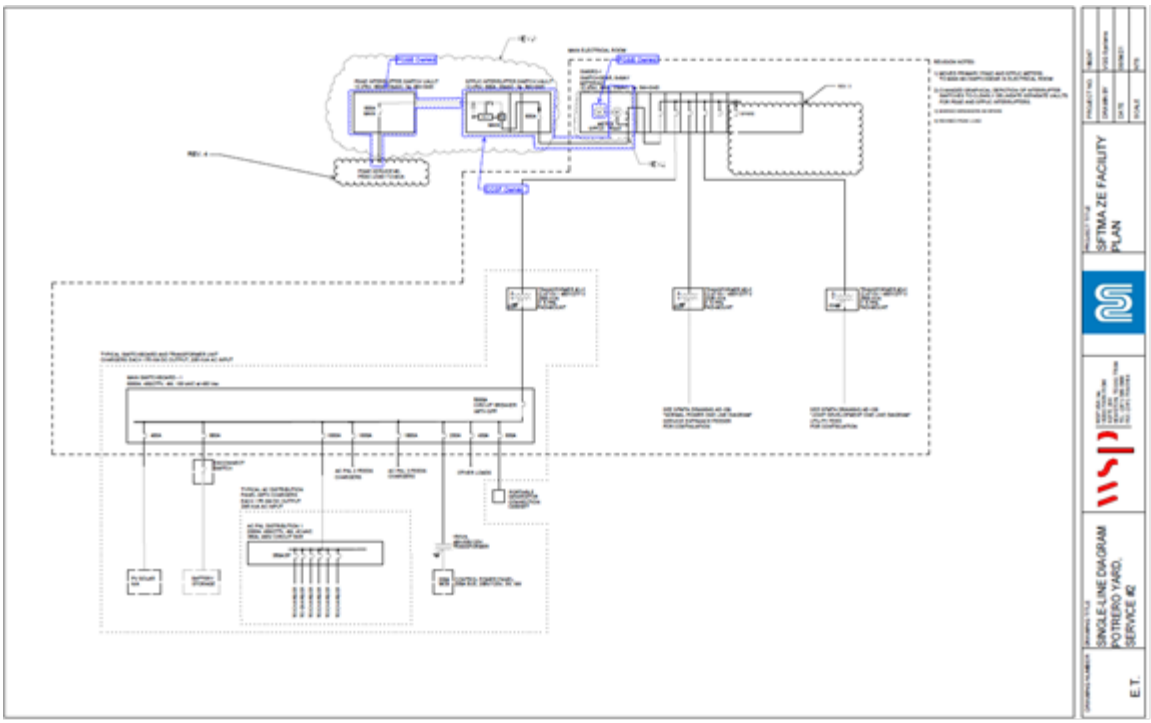


Table 2: Estimated Demand Profile of Facility

FEEDER 2 / MIXED USE

Winter	Residential	Commercial	BEB	Total (kW)
12:00 AM	1749.4	1975.1	2550.0	6274.4
1:00 AM	1582.2	1649.6	2281.0	5512.8
2:00 AM	1634.4	1581.6	2328.8	5544.9
3:00 AM	1737.0	1548.0	2121.2	5406.2
4:00 AM	1924.8	1732.1	1755.7	5412.7
5:00 AM	2167.0	2173.3	1496.2	5836.4
6:00 AM	2628.2	2707.0	1276.3	6611.5
7:00 AM	3010.6	2701.7	1012.7	6725.0
8:00 AM	2920.2	2704.5	750.4	6375.2
9:00 AM	2679.9	2606.2	424.1	5710.2
10:00 AM	2421.1	2542.7	240.7	5204.5
11:00 AM	2410.7	2840.4	182.0	5433.2
12:00 PM	2347.9	3003.7	107.9	5459.5
1:00 PM	2325.5	3316.2	19.6	5661.2
2:00 PM	2286.9	3631.5	0.0	5918.4
3:00 PM	2249.6	3778.8	0.0	6028.4
4:00 PM	2494.4	4329.2	0.0	6823.6
5:00 PM	2825.0	4823.7	0.0	7648.7
6:00 PM	2952.2	4900.0	0.0	7852.2
7:00 PM	3000.0	4799.3	0.0	7799.3
8:00 PM	2944.6	4611.1	64.1	7619.8
9:00 PM	2677.2	3979.9	681.0	7338.0
10:00 PM	2355.6	3361.0	1645.8	7362.4
11:00 PM	2066.5	2606.2	2461.0	7133.7
		4900.0		7852.2

Figure 2: Electrical Single Line Diagram of Facility



Study Assumptions

The infrastructure and protection evaluation will identify any new PG&E substation facilities or distribution upgrades necessary to interconnect the Customer's facility using the following assumptions:

1. The maximum net electrical load demand to be served at 2500 Mariposa St (Mix) is 7.80 MW.
2. The customer will engineer, procure, construct, own, and maintain its project facilities up to the intervening facility.
3. The study will consider all PG&E distribution projects in the Project vicinity.

PG&E has estimated a study fee of $25,000 for performing the SIS based upon the scope of this study plan. The final cost to complete the SIS will be based on actual cost.

PG&E will provide the SFPUC a record of actual costs for performing this SIS roughly two months after the SIS is completed. PG&E will bill the SFPUC the remaining balance if the actual cost is higher than the estimated $25,000. If the actual cost is less than the estimated study fee, PG&E will return the balance to the SFPUC within thirty (30) days of such determination.

Evaluation of Distribution Interconnection

PG&E's Distribution Planning Department evaluated the capability of the existing distribution system to serve the maximum load at 2500 Mariposa St (Mix).

Infrastructure Scope and Feasibility: To mitigate forecasted overloads triggered by the new primary service load, it is required to install and extend a new 12 kV distribution feeder from Potrero Substation. The scope is the following: installing a new 12 kV breaker and IPAC relay package at Potrero Substation, extending new mainline cable from the breaker to an existing 6" conduit system on Illinois St and 23rd St, installing ~9,500 ft of 1100 AL EPR in existing 6" conduits up to 17th St and Arkansas St, and trenching and installing additional 1100 AL EPR up to 17th and Hampshire St. Additional 1100 AL EPR will be installed along 6" conduits to land on a new 600 Amp switch – interrupter – switch in a #7 box. 600 AL EPR will be installed from the PG&E interrupter to the SFPUC interrupter to feed 2500 Mariposa St (Mix). A tie will be installed between each PG&E switch-interrupter-switch serving 2500 Mariposa loads.

Distribution reinforcement details are as follows:

Install New Feeder at SF A Substation and Line Extension	**$ Cost**
Direct Assignment Facilities:	
Tie-in Electric Service to New Feeder (12 months)	
Install 600 Amp switch-interrupter-switch in #7 box	**$120,000**
Trench and install ~20 ft of 600 AL EPR in 6" conduit + 6" spare	**$15,600**
Distribution Upgrades:	
Install New Substation Transformer (48 months)	
Install 75 MVA 115/12 kV transformer and switchgear at SF A Substation (Ongoing)	**$0**
Install new 12 kV bus section and switchgear at SF A Substation (Ongoing)	**$0**
Install New Feeder at SF A Substation and Line Extension (36 months)	
Install new feeder breaker and associated IPAC relay package	**$950,000**
Install 600 Amp 3-way 3-way switch	**$80,000**
Trench and install ~300 ft of 1100 CU LSZH + 3 6" spare conduits	**$330,000**
Trench and install ~200 ft of 1100 AL EPR in 6" conduit + 3 6" spares	**$156,000**
Install ~9,500 ft of 1100 AL EPR in existing 6" conduit	**$5,700,000**
Trench and install ~2,900 ft of 1100 AL EPR in 6" conduit + 6" spare	**$2,262,000**
Install ~600 ft of 1100 AL EPR in 6" conduit	**$360,000**
Estimated Cost	**$9,973,600**

Figure 3: Proposed Distribution Scope

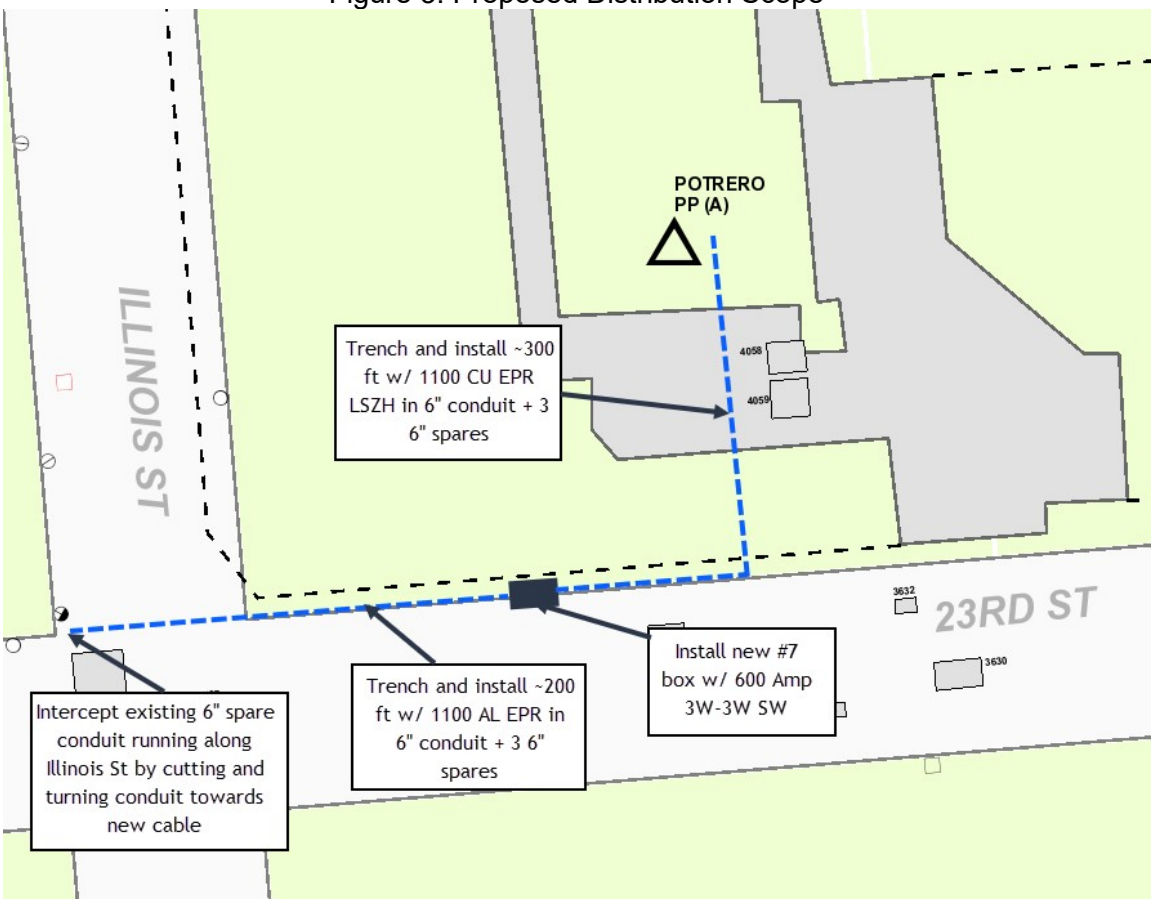


Figure 4: Proposed Distribution Scope

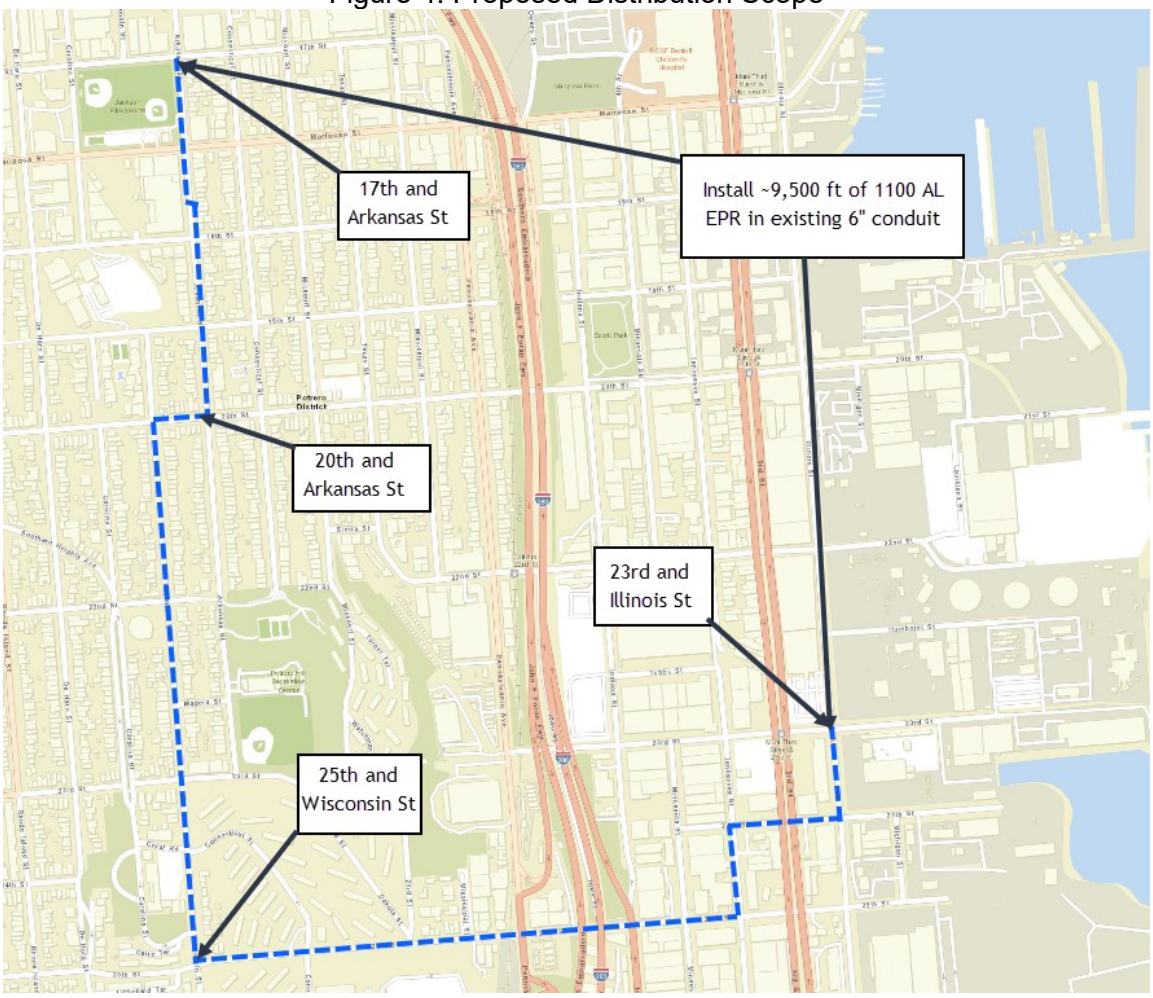


Figure 5: Proposed Distribution Scope

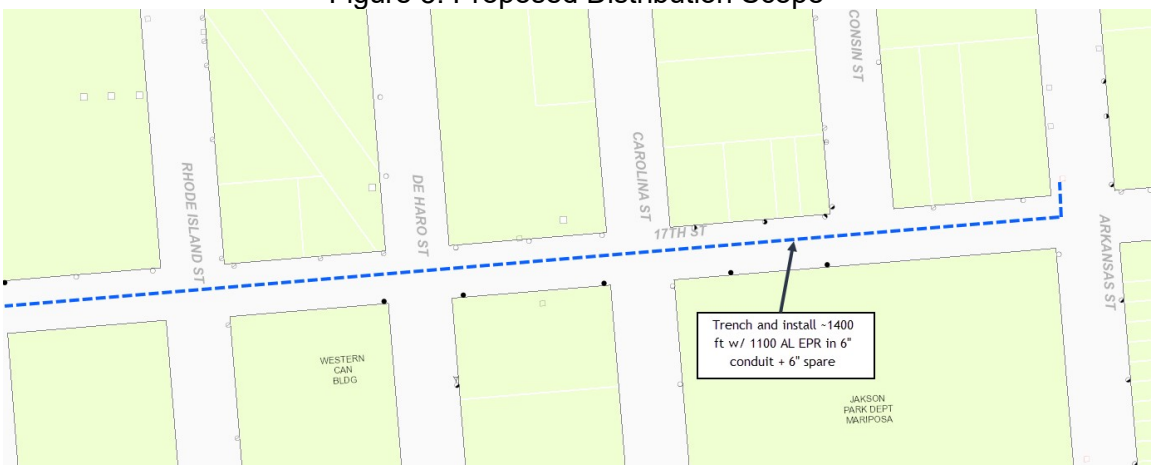


Figure 6: Proposed Distribution Scope

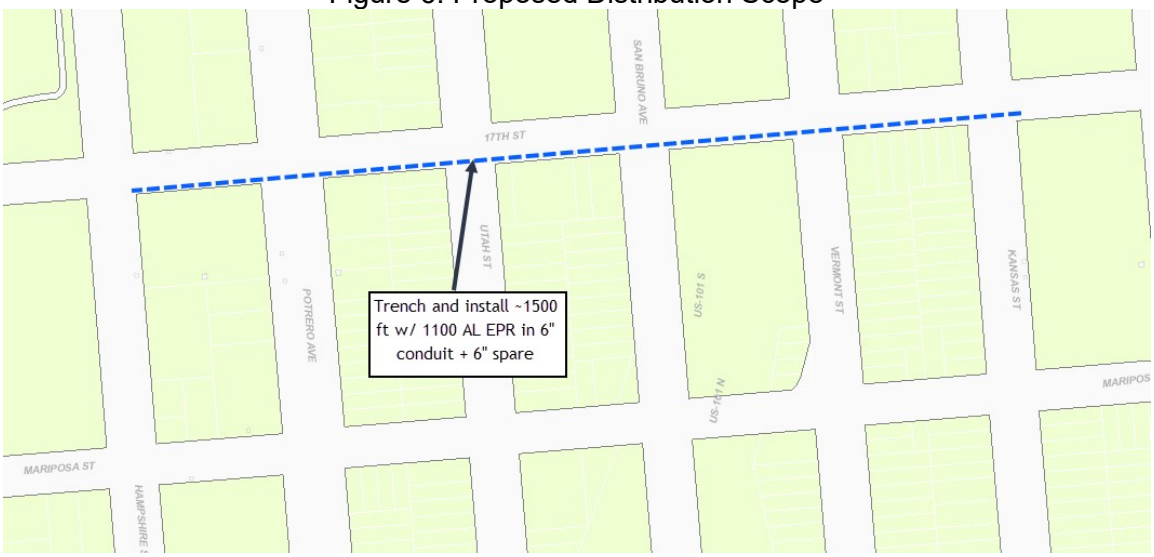


Figure 7: Proposed Distribution Scope

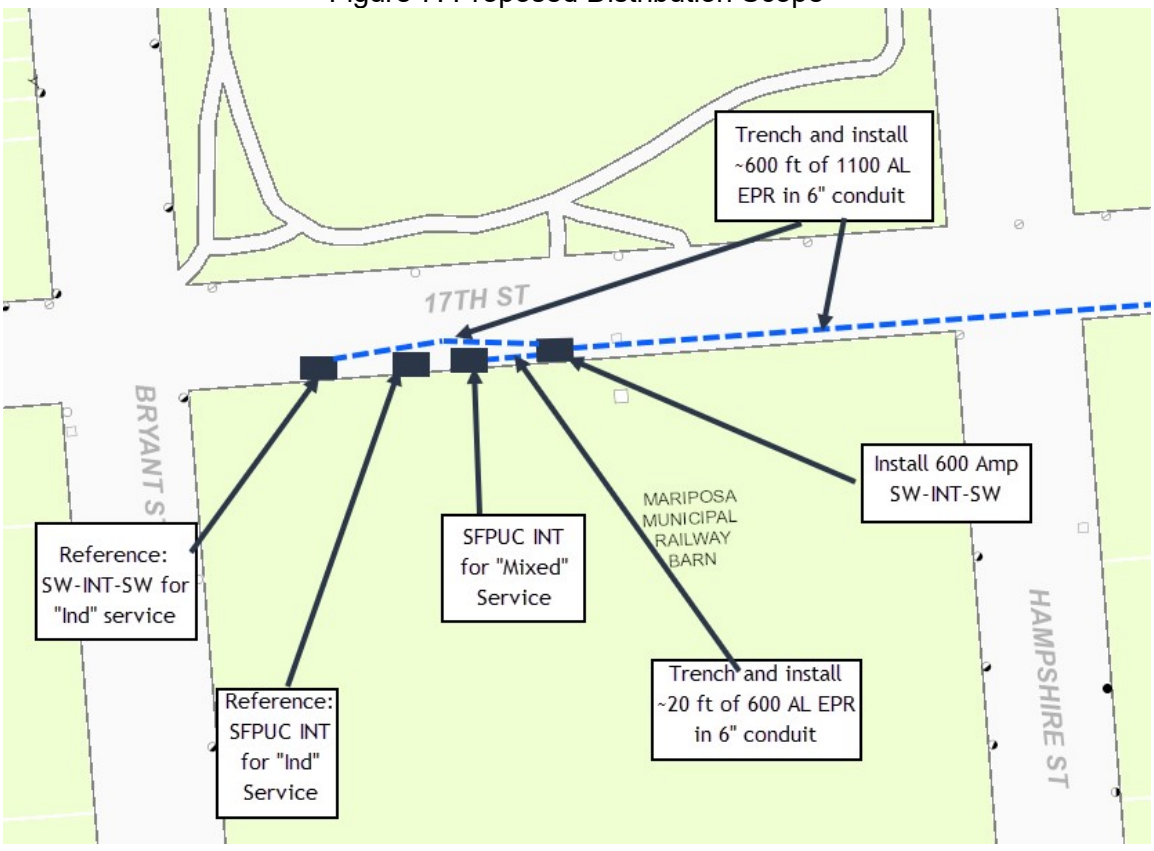
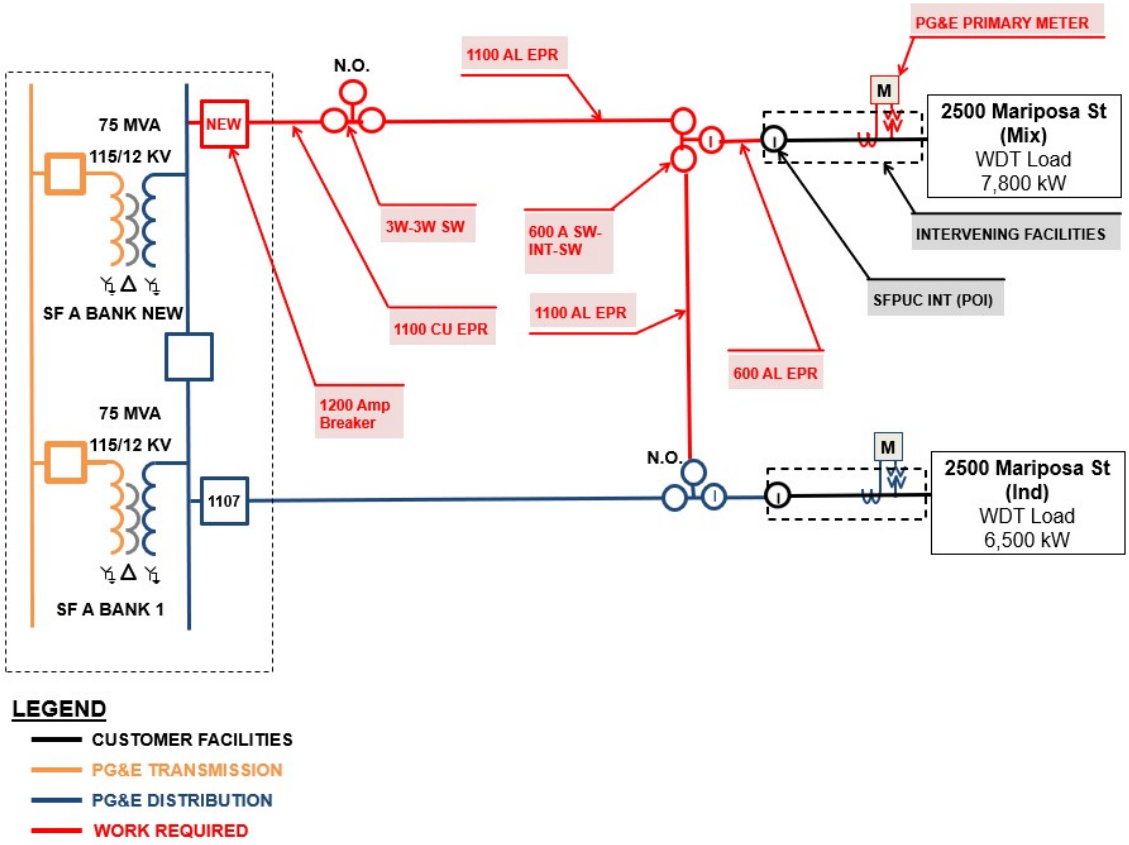


Figure 8: Single Line Diagram



Cost Estimates

Costs provided in this report are non-bMixing good faith cost estimates only. These costs have little degree of accuracy and are provided for informational purposes only.

Cost estimates will be provided, if applicable, when the Project progresses to the Facilities Study. Charges for implementing these interconnections and facility modifications, if the SFPUC decides to proceed, will be made based upon the actual costs incurred.

Ownership of Facilities

If this SIS determines that equipment needs to be installed in SFPUC's facilities, such installation will be the responsibility of SFPUC. Any equipment found to be required within PG&E's facilities will be the responsibility of PG&E, and the terms of the WDT will determine who is financially responsible to pay for such equipment.

Technical Requirements

In addition to interconnection requirements listed in this SIS, the electric and gas service requirements, and policies for establishing electric or gas service for new or remodeled customer installation are detailed in PG&E's Greenbook. The PG&E Greenbook provides detailed connection requirements for grounding and safety, among other requirements. A copy of the PG&E Greenbook can be downloaded under the following website: http://www.pge.com/greenbook/

1. Metering

Metering will be measured at the "change in ownership" point. It is the responsibility of SFPUC to provide the necessary structures, substructures, foundations, and disconnect switches for mounting and connection of the metering transformer. The meter location and grounding must meet all the requirements of IEEE80 for equipment safety and touch and step potential protection. Specific design details should be presented for review and approval prior to construction.

2. Voltage Regulation

SFPUC should specify tap ratios for its transformers to support appropriate low-side voltage.

3. Power Factor

SFPUC will be obligated to meet its power factor requirements as outlined in WDT.

Study Updates

The SIS will be performed in accordance with the assumptions listed in the Section titled "Study Assumptions". If these assumptions become invalid, an updated study may be required to re-evaluate SFPUC's interconnection impact on PG&E's electric distribution system. Changes that might prompt an updated study are:

1. Change in the interconnection date or the timing of subsequent load additions.
2. Change in the projected amount of initial load or subsequent loads.
3. Change in the interconnection plan.

The SFPUC would be responsible for paying for any such updating study.

APPENDIX I:
SDAT REVIEW LETTER 1.19.2023
(FOR REFERENCE)

San Francisco Planning

49 South Van Ness Avenue, Suite 1400
San Francisco, CA 94103
628.652.7600
www.sfplanning.org

SDAT REVIEW LETTER

Date: 1/19/2023

Project Address: 2500 Mariposa Street
Planning Record Number: 2019-021884PRJ
Assigned Planners: Mat Snyder, Gabriela Pantoja, Jennifer McKellar, Trent Greenan, Patrick Race

The Street Design Advisory Team (SDAT) provides design review and guidance to projects working within the City's public right-of-way. SDAT is composed of representatives from the San Francisco Planning Department (SF Planning), the San Francisco Fire Department (Fire), San Francisco Public Works (Public Works), the San Francisco Municipal Transportation Agency (SFMTA), and the San Francisco Public Utilities Commission (SFPUC).

SDAT REVIEW HISTORY:

1st Review	2nd Review	3rd Review
May 11, 2020	November 15, 2022	

Below are the SDAT comments from the 2nd SDAT review.

PROJECT DESCRIPTION:

The proposal is to rebuild, expand, and modernize the Potrero Yard Muni Bus Maintenance Facility located at 2500 Mariposa Street, (bounded by Mariposa Street, Hampshire Street, Bryant Street and 17th Street), and replace it with an approximately 145-foot, mixed-use building with a four-story bus garage and eight levels of residential for a total area of 1,300,000 square feet. Of the 1,300,000 square feet, 723,000 square feet will be dedicated to the public facility, 544,000 square feet for the residential use (575 dwelling units), and 33,000 square feet of commercial space at the ground floor. The proposal includes two new curb cuts along Mariposa Street, new ADA ramps at all four intersections, 42 street trees, 37 Class 2 bicycle parking spaces, and three new bulbouts.

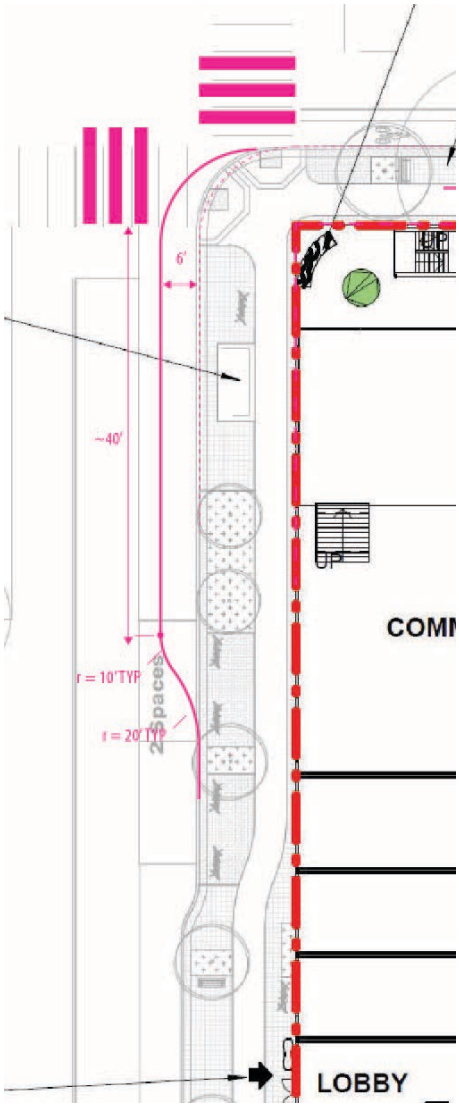
CONDITIONS REQUIRING STREET DESIGN REVIEW:

☒ Planning Code 138.1 (required streetscape improvements per the Better Streets Plan)
☒ Vision Zero
☐ Other:

SDAT COMMENTS

1. Bulbout (required per Planning Code Sec. 138.1)

- SDAT appreciates the addition of bulb-outs projecting into Bryant Street and Hampshire Street at the Mariposa Street intersection, and projecting into Hampshire Street at the 17th Street intersection, per May 11, 2020, SDAT comments. Given the high volume of bus movements to/from the project site, it is critical that all bulbs are analyzed for bus turning movements – particularly right turns from southbound Hampshire Street to westbound Mariposa Street (and into bus yard entry), from westbound Mariposa Street to northbound Bryant Street and from eastbound 17th Street to southbound Hampshire Street.
- SDAT recommends coordinating with SFMTA to confirm future plans for the bus stop at this intersection and installing a transit bulb out projecting into Bryant Street at the 17th Street intersection if the bus stop will remain. This may require the shifting of loading south of the transit bulb. Please coordinate with SFMTA on the layout and provision for a transit shelter, if applicable.



Transit Bulb into Bryant Street at SE corner of 17th Street

- The project is responsible for any utility work associated the construction of the bulb-out including potential work related to the relocation of the high-pressure fire hydrant shut-off valve if needed.

- Turn Templates: With your next submission to SDAT, please submit the following turn templates for all bulbouts and intersections. Note that turn templates must be approved by SDAT prior to Planning entitlement.
    - AASHTO 2011 WB-40
    - AASHTO Bus 45
    - Custom SFMTA 60' Bus
    - Custom SFFD Engine
    - Custom SFFD Ladder

Follow-up for Bulbouts	Pre-entitlement/Next SDAT • Sponsor to submit revised plans to SDAT showing required bulbout(s) as any relevant turn templates • Bulbout curb returns shall conform to SF Public Works' Standard Plan for Curb Bulbs. See: http://sfpublicworks.org/sites/default/files/87%2C175.pdf Pre- or Post-entitlement • Obtain relevant permits from BSM www.sfpublicworks.org/services/permits

2. 17th St Street Frontage

- SDAT has significant concerns about the pedestrian and bicycle experience and safety along the 17th Street frontage, given how the building is designed now with a blank wall and inactive frontage. This is especially concerning given that this is the frontage facing onto the park, and given how unsafe and unpleasant blank frontages on existing MTA facilities already have proven to be today (e.g., 15th, 16th, and Folsom Street frontages of the nearby Flynn Division, the Masonic Ave frontage of Presidio Yard, the Indiana St frontages of Woods Yard, and the San Jose and Ocean Ave frontages of Cameron Beach Yard).
- Given that this project is both a major and a public development project, its streetscape design should lead by example and be a model of the most up-to-date street design best practice. SDAT draws your attention to the following from the Better Streets Plan's governing Admin Code 98.1(d)(10): "Major new developments, both public and private, often include the rebuilding of portions of public right-of-ways and should serve as models of the Better Streets Policy. Special efforts should be made to ensure that such new developments lead by example. *Public projects should establish model street and open space designs and private projects should incorporate stronger street design and landscaping standards.*" If an inactive façade on 17th Street is unavoidable, the sidewalk and building façade design of 17th Street should be a model for how to design an important street with an inactive façade.
- We strongly encourage exploring all avenues for targeted building program and design modifications that could enable more active use of the 17th Street ground-floor. If the bus ramps are the primary barrier standing in the way of activation of 17th Street as currently designed, any feasible way to shift them inward should be explored, if it has not been already. Shifting them ~30' to the next structural bay would be ideal, if at all possible, and could even allow another liner of housing.
- At minimum, we request that you clearly describe and illustrate the design intent for the 17th Street frontage if active uses are not practical for the entirety of the frontage given the various requirements of the Project.

3. Accessible Curb Ramps (Required per Public Works Order No: 185854) and Accessibility Requirements

- The project is required to upgrade/install accessible pedestrian ramps at all street corners with existing curb ramps that do not comply with current City Standards, including the midblock crossing along Mariposa at York Street.
- See exhibit below for which illustrates red circles at curb ramp locations triggered by the project. Submit Existing Curb Ramp Inspections and corresponding photographs for all existing curb ramps proposed to remain as part of Street Improvement Permit.
- Construct new SE-R and NE-L curb ramps at York and Mariposa as part of this project. Revise site plan to show 6 directional curb ramps at this intersection. The midblock crosswalk(s) at York should be marked on the project plans.
- Public Works Order 184,350 requires sponsors installing ADA-compliant curb ramps at crosswalks to install receiving ramps at the opposite end of the crosswalk if none exist or if an existing ramp does not comply with current City standards. In addition to the ramps required along the project frontage, the project sponsor will be required to install new ramps on the receiving end of each crossing, if the existing receiving ramps do not comply with current City Standards.

Sidewalk Encroachments and Standard Paving Materials

- Set back elements from private plazas including benches so they do not encroach into the Public ROW. Revise design of the Bryant Street sidewalk accordingly to remove encroachments.

- Revise design to provide SF City Standard Sidewalk Paving Material from back of walk to the furnishing zone of the sidewalk. Eliminate proposed change in material at frontage zone. If the planned need is sidewalk tables and chairs, that can be handled with an approved BSM Tables and Chairs permit and movable pedestrian diverters.

- Remove proposed building frontage zones from sidewalk adjacent to bus stops and passenger loading zones. Building frontage zones may be problematic at these areas due to higher pedestrian use and potential for congestion.

Follow-up	Pre-entitlement/Next SDAT • Show conceptual ramp locations in future SDAT submittal. Pre- or Post-entitlement • Meet with the Public Works Disability Access Coordinator's Office to ensure ramp designs meet City standards. (Public Works Standard Curb Ramp Plans) • Obtain relevant permits from BSM
Contacts	Karina Lairet (karina.lairet@sfdpw.org), Public Works Disability Access Coordinator's Office

4. Curb Cuts (Required by Public Works and SFMTA)

- City policy prohibits curb cuts the sole purpose of which are used to transfer trash bin to and from the curb. Remove the proposed curb cut for waste collection on Hampshire Street.

5. Driveways & Garage Access

- Turn Templates: With your next submission to SDAT, please submit the following turn templates for all access points for buses into and out of the bus yard from Mariposa Street. Note that turn templates must be approved by SDAT prior to Planning entitlement.
    - AASHTO Bus 45
    - Custom SFMTA 60' Bus
    - Other expected design vehicle

Follow-up for curb cuts, driveways & garage access	Pre-entitlement/Next SDAT submittal • Submit loading demand analysis and loading operations plan • Submit turn templates for design vehicle
Contacts	Coordinate with your assigned Planner

6. On-street Loading

- It is unclear to SDAT who the on-street commercial loading is for on the south side of Mariposa Street and the east side of Hampshire Street.
- Commercial Loading: please detail commercial loading space lengths and intended design vehicle in next plan submittal.

- Passenger loading zones shall comply with accessibility requirements. Revise site plan to show proposed passenger loading zones (white curb) and revise layout to comply with Standard Accessible Passenger Loading Zone Drawings at the link below: https://sfgov.org/mod/sites/default/files/Documents/Bulletin10_PassengerLoadingZones.pdf
- On-site passenger loading requires a vertical clearance of not less than 114 inches and room to maneuver paratransit size vans in and out with turn around. Any planned valet parking requires an accessible passenger loading zone within the parcel.
- Bike racks are not permitted on sidewalk adjacent to passenger loading zones. Relocate bike racks accordingly.
- The project shall come back to SDAT prior to finalizing the project description for environmental review and the sponsor shall submit the project's loading needs analysis and a loading operations plan regarding both off-street and on-street loading operations. While developing the project description, the sponsor shall work with the project's environmental/transportation planner and with Paul Kniha (paul.kniha@sfmta.com), SFMTA Color Curb Program Manager, and Karina Lairet (karina.lairet@sfdpw.org), Associate Engineer with the Public Works Disability Access Coordinator, to discuss and revise the project's loading needs and corresponding accessibility requirements.

Follow-up	Pre-entitlement/Next SDAT • Sponsor to submit written statement to Planning expressing intention to follow-up on this item • Submit the project's loading needs analysis and a loading operations plan regarding both off-street and on-street loading operations • The project shall come back to SDAT prior to finalizing the project description for environmental review and the sponsor shall submit the project's loading needs analysis and a loading operations plan regarding both off-street and on-street loading operations. • If it has not happened already, meet with both SFMTA Loading Team & Public Works Accessibility Coordinator to coordinate design of loading zone(s), . Post-entitlement (Post-Certificate of Occupancy) • Sponsor to apply for on-street loading zones from the SFMTA permits from SFMTA https://www.sfmta.com/online-color-curb-application)
Contacts	Karina Lairet (karina.lairet@sfdpw.org), Associate Engineer with the Public Works Disability Access Coordinator Paul Kniha (paul.kniha@sfmta.com), SFMTA Color Curb Program Manager Jennifer McKellar (Jennifer.mckellar@sfgov.org), Senior Environmental Planner, SF Planning

7. Street Trees

- The project is required to install street trees along all frontages. Please coordinate with SF Public Works Bureau of Urban Forestry for guidance on spacing of tree basins.
- Per SFMTA standards, trees are not allowed within 25 feet of the corner property line on approach, but trees can be placed closer to the intersection on exit, to enhance pedestrian visibility and safety. One tree proposed along 17th Street approaching Hampshire should be verified it's not within 25 feet of the corner property line.

- Trees are generally not permitted at T-intersections with pedestrian mid-block crossings as is present at Mariposa and York. This is due to limited sightlines between pedestrians, bicyclists and vehicles approaching the crosswalk. Please coordinate with SF Public Works Bureau of Urban Forestry for guidance.
- The existing trees along all frontages shall remain unless determined otherwise by SF Public Works Bureau of Urban Forestry (BUF). Any proposed new, removed, or relocated street trees and/or landscaping within the public sidewalk may require a permit from SF Public Works Bureau of Urban Forestry (BUF).

Follow-up	Pre-entitlement/Next SDAT • Sponsor to submit written statement to Planning expressing intention to follow-up on this item • Submit plans that differentiate existing trees from new trees • Submit revised plans that address tree placement comments above Post-entitlement • Sponsor to obtain any required permits from Public Works Bureau of Urban Forestry (BUF)
Contacts	Public Works Bureau of Urban Forestry, urbanforestry@sfdpw.org, 628-652-8733

8. Street Lighting

- If existing lighting conditions on fronting the project site do not meet City standards, the project will be required to upgrade street lighting and/or pedestrian lighting. To determine if lighting improvements are required, the sponsor will need to provide photometric studies for street lighting plans to the SFPUC.
- Please coordinate with the SFPUC Streetlights Division on this item at Streetlights@sfwater.org. The sponsor shall submit written statement to SDAT expressing intention to follow-up on this item.

9. Transformer

- SDAT supports the proposed location of a transformer room. Confirm all location and access requirements with PG&E prior to submitting the final building designs to the Planning Department.

Follow-up	Pre-entitlement/Next SDAT • Sponsor to show proposed transformer locations on plans to be submitted and approved by SDAT • Coordinate with SFPUC or PG&E to ensure proposed transformer location meets relevant standards.
Contacts	• Transformer Location: Coordinate with your assigned Current Planner on this item • Transformer Location Technical Feasibility: Coordinate with electrical power utility (SFPUC or PG&E) and Public works BSM.

10. Waste Collection

- Please provide trash loading and removal strategy explaining how trash bins will be moved between the trash storage area and the street on pickup days.
- Provision for trash removal should not be in the public right-of-way as is indicated on the plans. Please update plans to reflect no incursion into the public right-of-way.

- See item #3. City policy prohibits curb cuts the sole purpose of which are used to transfer trash bin to and from the curb. Remove the proposed curb cut for waste collection on Hampshire Street.

Follow-up	Pre-entitlement/Next SDAT • Sponsor to submit trash loading and removal strategy to SDAT
Contacts	Coordinate with Recology to ensure proposed trash strategy is feasible

11. Outswing Doors

- Out-swinging doors on all project frontages shall be recessed from the plane of the exterior wall to prevent pedestrian traveling on the sidewalk from being struck by opening doors.

ADDITIONAL STREET DESIGN CONSIDERATIONS

12. Related City Projects – Area Plans/Public Realm Plans

- The project is located within the Eastern Neighborhoods Plan (Mission) and the Mission District Streetscape Plan. The project sponsor is encouraged to read both plans and integrate planning work done to date.
  - Eastern Neighborhoods Plan: https://generalplan.sfplanning.org/Mission.htm
  - Mission District Streetscape Plan: https://sfplanning.org/sites/default/files/archives/CDG/docs/missionstreets/MDSP_FINAL_DRAFT_OCT2010.pdf

13. 17th Street Bikeway

- SDAT encourages the project to consider a raised cycle track along the 17th Street frontage rather than an at-grade facility.

14. Hampshire Street Sidewalk

- 90-degree curb returns cannot be cleaned by Public Works mechanical street sweepers. Please revise curb returns to meet SF Public Works' Standard Plan for Curb Bulbs or confirm plans for street sweeping.

ADDITIONAL INFORMATION REQUIRED FOR NEXT SDAT REVIEW

☒ Existing/proposed curb cuts and curb cuts to be removed
☒ Street names
☒ Dimensions of existing and proposed sidewalk and curb extensions on plans
☒ Dimensions of existing and proposed curb cuts on plans
☒ Dimensions of existing and proposed transit stops
☒ Site plan with streetscape features (e.g., bulbouts, trees, transit shelters, benches, bike racks)
☒ Proposed street tree locations
☐ Adjacent ROW widths
☒ Locations of existing utility poles and hydrants
☒ Turn templates for bus yard access
☐ Curb-to-curb section, including dimensions of tree wells and path of travel
☐ Proposed transformer vault location
☒ A written statement clarifying that Standard SDAT Comments have been reviewed

STANDARD SDAT COMMENTS

For your next SDAT submittal, please review the “Standard SDAT Comments” which can be found on the SDAT website (https://sfplanning.org/project/street-design-advisory-team), and include a written statement clarifying that this task has been completed and that all plans are consistent with guidelines/standards enumerated in the "Standard SDAT Comments”.

SDAT Members:

SF Public Works: Chris Buck, Berhane Gaime, Kevin Jensen, Jung Johnson, Karina Lairet, Eric Lam, Debra Lutske, Denny Phan, Suzanne Suskind, John Thomas, Michelle Woo, John Kwong, Jennifer Cooper

SFMTA: Paul Kniha, Westley Myles, Francesca Napolitan, Ricardo Olea, Mike Sallaberry, Norman Wong, Dustin White, Adam Smith

SF Planning: Kimberly Durandet, Nicholas Foster, Ryan Shum, Jessica Look, Ilaria Salvadori, Patrick Race, Ben Caldwell

SFPUC: Derek Adams, Mira Chokshi, Hieu Doan, Molly Petrick, Joan Ryan, Sam Young

SFFD: Ramon Flores

APPENDIX J:
GEOTECHNICAL BASELINE REPORT

GEOTECHNICAL BASELINE REPORT
SFMTA Potrero Facility Rebuild
San Francisco, California

Prepared For:

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5 June 2024
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TABLE OF CONTENTS

ATTACHMENTS

FIGURES

APPENDICES

GEOTECHNICAL BASELINE REPORT
SFMTA Potrero Facility Rebuild
San Francisco, California

1.0 INTRODUCTION

This Geotechnical Baseline Report (GBR) has been prepared by Langan CA, Inc. (Langan) for the new San Francisco Municipal Transit Authority (SFMTA) Potrero facility in San Francisco, California. The project site occupies one city block and is bound by 17th Street on the north, Hampshire Street on the east, Mariposa Street on the south, and Bryant Street on the west, as shown on Figure 1. The proposed development will be a 7- to 13-story mixed-use structure that will include a new bus maintenance facility and affordable and mixed income housing.

This GBR presents baselines with respect to certain subsurface conditions that are expected to be encountered during construction that may influence the contractor's rate of progress, tooling selection, tool wear, or approach to bidding the project. The GBR establishes a contractual basis for allocation of geotechnical risk during performance of the work; it does not define the single correct interpretation of geotechnical conditions. This baseline report represents the conditions the contractor is to assume for bidding purposes and for which the contractor is responsible for during construction.

This report includes:

- a summary of the geological and geotechnical information obtained for the project;
- interpretation of anticipated ground and groundwater conditions to be encountered, including interpretive geologic and geotechnical subsurface profiles;
- a summary of how these anticipated conditions have influenced the project design and are expected to impact construction;
- discussion of other design and construction considerations that will impact construction.

Interpretation of subsurface information contained in this GBR has included interpolation between widely spaced subsurface exploration points, extrapolations beyond points of exploration, and review of laboratory test data. Soil and rock deposits vary in type, strength, and other important properties between points of exploration. The judgements assume the use of appropriate means, methods, and levels of workmanship. Ultimately, the behavior of the soil and rock deposits present in the surface and subsurface excavations will be influenced by the contractor's means and methods, and levels of workmanship.

This GBR is to be read in conjunction with the following project Geotechnical Design Report (GDR), which is part of the Contract Documents:

- Geotechnical Investigation Report (Draft), SFMTA Potrero Facility Rebuild, San Francisco, California, dated 23 June 2023, by Langan.

Some of the technical concepts, terms, and descriptions in the GBR may not be familiar to bidders. It is highly recommended that bidders engage a California registered geotechnical engineer or engineering geologist who is familiar with all topics of this report, to carefully review and explain this information so that a complete understanding of the information presented in the GBR can be developed prior to submitting a bid.

Certain drawings and figures contained in other documents in the Contract are referenced by the GBR as an aid to bidders in understanding the elements of the work. Such drawings are not reproduced in the GBR, so this GBR shall be reviewed in conjunction with the Drawings and Specifications and all documents in the Contract.

The GBR was performed in general accordance with our scope of services outlined in our add service request dated 15 December 2023.

2.0 PROJECT DESCRIPTION

The project site is rectangular with plan dimensions measuring approximately 480 by 410 feet. It is occupied by an existing paved electrified-bus parking area on the western portion of the site and a one- to two-story bus maintenance facility with rooftop parking and below-grade vehicle service pits on the eastern portion, as shown on Figure 2. The existing grade of the surrounding streets generally slopes down towards the southwest, with the high point at the corner of 17th Street and Hampshire Street and lowest point at the corner of Mariposa Street and Bryant Street. The current SFMTA facility is generally at the elevation of Mariposa Street to the south at Elevation 53.5 feet[1], with up to about 22 feet of retained soil and rock at the northeastern corner of the site where existing adjacent street grade is highest.

According to a review of the 50 percent schematic design drawings (IBI Group, 2023), we understand that the current plans are to demolish the existing paved electrified-bus parking area

[1] All elevations reference the City & County of San Francisco Vertical Datum of 2013 based on North American Vertical Datum of 1988 (CCSF-VD13); ground surface elevations are based on the ALTA/NSPS Land Title Survey by IBI Group, dated 3 May 2023.

and the bus maintenance facility and replace them with a 7- to 13-story mixed-use structure that will include a new bus maintenance facility and affordable and mixed income housing.

The proposed finished floor elevation of the ground floor is currently Elevation 50 feet, and the maximum building height is anticipated to be 145 feet above the ground floor, excluding penthouses. A description of the proposed development is as follows:

- The footprint of the new bus maintenance facility will be east of gridline B[2], as shown on Figure 3. The new bus maintenance facility will occupy the lower four levels (designated as Bus Floor), with the Bus Floor level heights ranging from 12 feet to 20.5 feet, with the roof of the bus maintenance facility 70 feet above the ground floor.

- East of gridline B, four- to seven-levels of affordable and mixed income housing units are planned above the new bus maintenance facility. West of gridline B, 13 floors of housing units are planned.

- The western portion of the site will have a one level basement, as shown on Figure 3; the proposed basement extends 20 feet below the ground floor elevation, with the finished floor elevation of the basement at Elevation 30 feet. In addition, a lower-level work area located between gridlines F to G and 8 to 10.5, as shown on Figure 3, is planned below the ground floor on the southeast portion of the site; according to Sheet S3003 of the structural drawings (Nabih Youssef Structural Engineers, 2023), the finished floor of the lower-level work area is 8.5 feet below the ground floor level, corresponding to a finished floor elevation of Elevation 41.5 feet. The remaining footprint of the site will have the ground floor at Elevation 50 feet.

3.0 MANMADE FEATURES

Most of the site along the east side is occupied by a 215-foot-wide bus maintenance facility, as shown on Figure 2. It is a double-height, single-story structure, and the floor level of the maintenance facility conforms to the elevations of Mariposa Street. The garage area of the maintenance facility includes below-grade vehicle service pits. There is roof parking on top of the maintenance facility, which is accessed from 17th Street. At this time, as-built drawings of the existing maintenance facility were not available for review.

The geotechnical investigation report by SCI (SCI, 1989), indicates the existing maintenance building is supported on spread footings extending to depths of up to six feet bgs. An asphalt and concrete paved electrified bus parking area occupies the remainder of the site. The bus

[2] Gridline based on Sheet A1001 titled, "Site Plan" by IBI Group dated 3 May 2023.

parking area includes ancillary facilities such as support poles for the overhead catenary system, guy wires and electrical lines, a bus washing station and trash compactor facility.

According to borings drilled in the electrified-bus parking area, the area is covered by a section of asphalt over concrete that has thicknesses ranging from 10 to 13 inches. Borings drilled in the existing maintenance building show the building's concrete slab is 6 to 14 inches thick. However, an environmental boring drilled recently in the southeast section of the existing maintenance building cored 22 inches through the existing concrete floor slab and did not find the bottom of the slab.

The site is relatively level as a result of being benched into a natural slope. Elevations of the parking area vary from Elevation 54 feet in the northeast corner to Elevation 48 feet in the southwest corner. Street grades along 17th Street are relatively flat along the eastern 1/3 of the street with elevations ranging from Elevation 75 to 77 feet; the western 2/3 of the street slope steeply with elevations varying from Elevation 75 to 62 feet at the intersection of 17th Street and Bryant Street. Grades along Bryant and Hampshire Street slope down towards Mariposa Street to Elevation 48 and 54 feet, respectively. The site grades generally conform to the street grades along Mariposa Street.

The site is surrounded by reinforced concrete retaining walls up to 23 feet high along Bryant and 17th Street and within the maintenance building along the eastern portion of 17th Street and along Hampshire Street. The available as-built records of the retaining walls that were included in the Arup/RYCB report (Arup, 2019) are included in Appendix A. According to the available as-built records, the walls are concrete walls supported on shallow foundations. The as-built records indicate that the shallow footings are of varying dimensions and embedment depths. According to the as-built records, the north and west retaining walls are backdrained; however, drawings with the details of the east wall were not available for our review. Detail sections on Drawing DL-9809 (see as-built drawings in Appendix A) shows granular drain material, surrounded by filter fabric, along the back of the existing north and west walls and a six-inch-diameter perforated pipe near the base of the walls; drawings of the east wall were not available for our review. If these walls are to be incorporated into the new building, the functionality of the drainage system shall be confirmed. In addition, new basement walls and associated floor slabs shall have drainage panels and underdrains, respectively to prevent the buildup of hydrostatic pressures. For baseline purposes, the contractor shall expect to use sumps to pump out water collected beneath the basement level and lower-level work area.

4.0 SOURCES OF GEOLOGIC AND GEOTECHNICAL INFORMATION

Details of the field exploration activities, laboratory testing and geophysical surveys are described in geotechnical investigation report (Langan, 2023).

Subsurface information was provided by the SFMTA's geotechnical engineer for the design-build bids, which consisted of a report titled *San Francisco Public Works, SFMTA Potrero Facility Rebuild, Geotechnical Engineering Report,* dated 11 November 2019 by Arup/RYCG A Joint Venture (Arup/RYCG). The Arup/RYCG's report included subsurface data by Subsurface Consultants Inc. (SCI), Earth Mechanics Consulting Engineers (EMCE) and by Treadwell & Rollo, Inc. (T&R) from borings performed at and in the site vicinity. The locations of previous exploration points are shown on Figures 2 and 3. Boring logs by SCI, ECME and T&R are presented in Appendix A. Arup/RYCG drilled six additional borings and performed in-situ seismic measurements using active and passive surface wave techniques along four seismic lines. The boring logs and laboratory tests from the Arup/RYCG's report, are presented in Appendix B and the geophysical survey is presented in Appendix C.

To further evaluate the subsurface conditions and excavatability of the bedrock at and in the vicinity of the site, Langan performed additional geophysical surveys. The locations of the geophysical surveys are shown on Figure 2. The geophysical survey results and a brief evaluation by Norcal are presented in Appendix D.

Results of the laboratory testing from the Arup/RYCG 2018 investigation are included in Appendix E.

5.0 GEOLOGIC SETTING

The project is in the northern part of the San Francisco Peninsula, which falls under the Coastal Ranges geomorphic province. This province is characterized by a series of north-northwest trending mountains and valleys. However, because of recent deposition, these ridges are generally not very visible in San Francisco. Only a few outcrops such as Russian Hill, Nob Hill, Telegraph Hill, Twin Peaks, Potrero Hill, Mount Sutro, Mount Davidson, and the Bayview Hills are exposed (Arup, 2018).

On the basis of our review of the map titled *Geologic Map of the City and County of San Francisco* (AEG, 2018, Modified from Blake and others, 2000; Bonilla, 1998, 1971; and Schlocker, 1974), the northeast portion of the site is underlain by bedrock of the Franciscan or Coast Range Ophiolite, specifically of the Hunters Point Serpentinite-Matrix Melange, while the southern and

western portions of the site are underlain by Pleistocene deposits as presented in Figure 4. The bedrock is mapped primarily as Serpentinite, but also includes zones of sheared shale. For baseline purposes, the contractor shall expect the serpentinite to contain naturally occurring asbestos (NOA).

6.0 GROUND CHARACTERIZATION

Our conclusions regarding the subsurface conditions described in this section of the report are based on the previously performed borings and laboratory tests and the results of the geophysical surveys performed at the site.

6.1 Subsurface Conditions

For engineering analyses, excavations and supporting systems, the soils at the were subdivided into soil Units 1 through 3 and bedrock as Unit 4. Interpretive subsurface profiles have been developed based on the information in the GDR and is provided shown on Figures 5 and 6.

Unit 1 - Fill: Unit 1 consists of fill, consisting of loose to dense silty sand, sand with silt, sand with gravel, clayey gravel, and silty gravel and soft to stiff sandy clay, was encountered beneath the existing pavement section and building slab. With the exception of BH-04, the fill thickness encountered was six feet or less; deeper fill, consisting of loose to medium dense silty gravel, clayey gravel, and silty sand with gravel, and medium stiff to stiff sandy clay was encountered to 11 feet bgs at BH-04, which was reported by Arup/RYCG as fill that is possibly associated with the construction of the maintenance building. Where tested, the fines of the silty sand fill have a plasticity index (PI) of 29 which indicates a high expansion potential.

For baseline purposes, the contractor shall expect the fill to be heterogenous, with loose to dense sand and gravel with varying fines, and soft to stiff clay and silt with high expansion potential. In addition, the contractor shall expect to encounter fill up to 11 feet below the existing ground surface elevation beneath the site and the fill includes man-made debris.

Unit 2 – Clay and Sand: Unit 2 consists of 6 to 9½ foot thick layer of soft to medium stiff sandy clay and loose to medium dense clayey sand and sand with clay and was encountered at the southeast corner of the site (Borings BH-SCI-05, BH-04, and BH-06) beneath the fill. Where tested, the sandy clay layer has PIs ranging between 20 to 22 and is moderately expansive.

For baseline purposes, the contractor shall expect up to 10 feet of loose to medium dense sand with varying fines and soft to medium stiff moderately expansive clays to be encountered beneath the fill at the southeast portion of the site.

Unit 3 - Colma Formation: Unit 3 consists of a medium dense to very dense sand with varying amounts of fines, known as the Colma Formation. The unit was encountered at the western and southeastern portions of the site. Where encountered, the sand is approximately 5 to 68 feet thick. The Colma Formation was encountered at depths ranging from approximately two feet (Elevation 51.4 feet) to 12 feet (Elevation 37.4 feet). Where tested, it contained 23 and 43 percent fines (particles passing the No. 200 sieve). The shear wave velocity measured in the Colma Formation is 1,000 to 2,000 feet per second.

For baseline purposes, the contractor shall expect the medium dense to very dense Colma Formation sand with fines content ranging from 20 to 45 percent to be encountered at the western and southeastern portions of the site. The contractor shall expect the top of the unit to be encountered at the elevations shown on the contour plan on Figure 7. The contractor shall expect the thickness of the unit to range from 5 to 70 feet.

Unit 4 - Bedrock: Unit 4 consists of bedrock of the Franciscan or Coast Range Ophiolite, specifically of the Hunters Point Serpentinite-Matrix Melange. The bedrock is mapped primarily as Serpentinite, but also includes zones of sheared shale. Serpentinite is expected to contain naturally occurring asbestos (NOA). During the site investigation, shale and serpentinite were both encountered where explored.

For baseline purposes, the contractor shall expect the unit to consist of bedrock of the Franciscan and Coast Range Ophiolite Formations and is soft to hard, weak to moderately strong and highly to completely weathered. The contractor shall assume the serpentinite bedrock contains naturally occurring asbestos (NOA). The contractor shall expect the top of the unit to be encountered at the elevations shown on the contour plan on Figure 8.

Groundwater: Groundwater was encountered at the site in two of the borings drilled by Arup/RYCG. In BH-01, groundwater was encountered at depths between 30 and 35 feet bgs, corresponding to Elevation 21.8 feet and Elevation 16.8 feet. Arup/RYCG reported perched groundwater above the bedrock encountered in BH-06 at a depth of approximately 9 feet bgs (Elevation 44.9 feet).

For baseline purposes, the contractor shall expect groundwater to be encountered at Elevation 22 feet or perched eight feet above the bedrock where bedrock is encountered above Elevation 22 feet. The contractor shall expect groundwater to exist in seams and fractures in the bedrock.

6.2 Soil Corrosivity

CERCO Analytical, Inc. had performed tests on five soil samples from the site to evaluate corrosion potential to buried metals and concrete for Arup/RYCG. The results of the tests as reported by Arup/RYCG in their geotechnical report are summarized in Table 3.

TABLE 3
Summary of Corrosivity Test Results

Test Boring	Sample Depth (feet)	pH	Sulfate (mg/kg)	Min. Resistivity (ohms-cm)	Chloride (mg/kg)
BH-01	7	7.44	28	1,400	N.D.
BH-01	41	7.95	N.D.	7,500	N.D.
BH-02	30	7.67	N.D.	8,400	N.D.
BH-02	48	7.27	60	320	N.D.
BH-03	2.5	8.77	22	1,900	N.D.

Note:
1. N.D. = Not detected

According to the resistivity measurements, the soil samples of the fill tested are classified as "corrosive" to buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron. All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron shall be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines shall be protected against corrosion.

For more detailed recommendations regarding the corrosion protection of buried metals and concrete, a licensed corrosion consultant shall be retained.

6.3 Naturally Occurring Asbestos (NOA)

Serpentinite bedrock containing NOA in the form of green rock fragments exhibiting chrysotile fibers (based on visual observations) has been encountered in Franciscan Complex bedrock. Chrysotile is a grey to green, soft, fibrous silicate mineral in the serpentine subgroup and is one of the most commonly encountered forms of NOA. Any asbestiform material shall be sampled and analyzed via the California Air Resource Board (CARB) 435 method for asbestos content.

Serpentinite bedrock was encountered at the site and therefore the site will be subject to the CARB Asbestos Airborne Toxic Control Measure (ATCM) for construction, grading, quarrying, and surface mining operations dated July 2001 during redevelopment. The CARB's Asbestos ATCM is enforced locally by the Bay Area Air Quality Management District (BAAQMD) and requires construction projects greater than one acre to prepare a site-specific Asbestos Dust Monitoring Plan (ADMP) for agency approval. The ADMP specifies dust mitigation measures that must be

initiated at the start and maintained throughout the duration of the excavation and grading activity per the ATCM. This shall include the following:

- Construction vehicle speed at the work site must be limited to 15 miles per hour (mph) or less.
- Prior to any ground disturbance, sufficient water must be applied to the area to be disturbed to prevent visible dust emissions from crossing the property line.
- Areas to be graded or excavated must be kept adequately wetted[3] to prevent visible dust emission from crossing the property line.
- Storage piles must be kept adequately wetted, treated with a chemical dust suppressant, or covered when material is not being added to or removed from the pile.
- Equipment must be washed down before moving from the property onto a paved public road.
- Visible track-out on the paved public road must be cleaned using a wet sweeping or a high-efficiency particulate air (HEPA) filter equipped vacuum device within 24 hours.

The project will be required to install a perimeter dust air monitoring network. This typically includes one upwind and two downwind dust monitors, the collection and analysis of daily samples (three per day at a minimum), and daily reporting of those results to BAAQMD throughout the duration of construction grading[4]. Once prepared, the ADMP will be enforceable at the site until post construction stabilization is complete, which shall include one or all of the following:

- establishment of a vegetative cover;
- placement of at least three inches of non-asbestos-containing material; and/or
- fully encapsulating the site in hardscape (i.e., asphalt, sidewalk, or building foundation).

[3] "Adequately Wetted" means sufficiently moistened with water to minimize the release of particulate matter into the ambient air as determined by the test method in ATCM subsection (h) (5).

[4] "Construction grading" means any surface disturbance conducted with powered equipment or any related activity, including, but not limited to, all surface and subsurface cuts and fills, excavation, trenching, stockpiling, bulldozing, and landfills.

7.0 CONSTRUCTION CONSIDERATIONS

From a geotechnical standpoint, the proposed project is feasible provided the recommendations presented in the GDR (Langan, 2023) are incorporated into the project plans and specifications and implemented during construction. The primary geotechnical issues for this project include:

- presence of undocumented fill and soft to medium stiff clays and loose to medium dense sands above the Colma Formation (Unit 3) at the southeast portion of the site,
- adequate foundation support,
- shoring for the proposed basement excavations and excavation into bedrock,
- potential presence of naturally occurring asbestos (NOA) in the serpentinite bedrock, and
- potential presence of groundwater perched on the bedrock and in bedrock seams and fractures.

7.1 Foundation and Settlement

For baseline purposes, the contractor shall expect bedrock (Unit 4) to be exposed at or just beneath the existing maintenance facility in the northeast portion of the site. The contractor shall expect the remainder of the site to be underlain by fill (Unit 1) over Colma Formation (Unit 3), with the exception of the southeast corner of the site where sand and clay (Unit 2) was encountered above the Colma Formation (Unit 3).

The primary factor influencing the design of the foundation system is the variability in the subsurface conditions across the site at the depths of the proposed foundations for the proposed building. Bedrock (Unit 4) and the Colma Formation (Unit 3) have a relatively high bearing capacity and low compressibility and where bedrock or Colma Formation (Unit 3) sand are encountered at or near the subgrade level, the structure can be supported on spread footing foundations. Where the depth to Colma Formation (Unit 3) or bedrock (Unit 4) renders footings uneconomical, drilled piers taking support in Colma Formation (Unit 3) or bedrock (Unit 4) may be used to support the structure. We expect footings and drilled piers supported in Colma Formation (Unit 3) or bedrock (Unit 4) will settle less than an inch.

For baseline purposes, the contractor shall expect where the finished floor elevation is less than five feet above the top of the Colma Formation (Unit 3) a shallow foundation system will be used. Where finished floor is greater than five feet above the top of the Colma Formation (Unit 3), the contractor shall install a drilled pier; this assumes a maximum practical footing depth of five feet.

The contractor shall anticipate the transition between footings and drilled pier foundations to occur where the top of Colma Formation (Unit 3) is at approximate Elevation 45 feet or deeper (see Figure 6 for the Elevation 45-foot top of Colma Formation (Unit 3) elevation contour line) where the proposed finished floor is at Elevation 50 feet. During initial stages of construction, the contractor shall expect to perform exploratory pits, borings, or piers along the proposed foundation transition line to verify the baseline assumptions.

7.2 Groundwater Considerations

The groundwater elevation is likely influenced by wet and dry seasons and will fluctuate a few feet. For baseline purposes, the contractor shall expect the groundwater will be encountered at Elevation 22 feet or at the top of bedrock (Unit 4) if bedrock is shallower than Elevation 22 feet.

Because the site is currently benched into a bedrock slope and groundwater may be perched on bedrock. During excavation groundwater may be encountered perched on top of bedrock or in fractures and may flow into the excavation. The contractor shall be prepared to control groundwater flowing into excavations by installing a drainage system and localized dewatering. The contractor shall be aware the City and County of San Francisco's permit requirements and fees for disposal of groundwater. Alternatively, an impervious shoring system could be installed in lieu of local dewatering and/or drainage system.

7.3 Excavation and Dewatering

According to the current project drawings (IBI Group, 2023), the proposed basement will have a finished floor elevation of Elevation 30 feet. In addition, a lower-level work area located between gridline F to G and 8 to 10.5, will have a finished floor elevation of Elevation 41.5 feet. Assuming average footing excavations of three feet, we anticipate the bottom of excavation elevations will range from Elevation 27 feet for the basement and Elevation 38.5 feet for the lower-level work area. According to the topographic map of the existing street and site grades, we estimate retaining heights ranging from 21 feet to 44 feet for the proposed basement and 10 feet for the lower-level work area.

It is anticipated that dense to very dense Colma Formation (Unit 3) sand and interbedded shale and serpentinite bedrock (Unit 4) with varying degrees of weathering will be encountered at the bottom of excavations. Although weak bedrock can be excavated with conventional earth-moving equipment, such as loaders and backhoes, capable of breaking the moderately hard bedrock, such as hoe-rams and large excavators will likely be required to remove some bedrock. For baseline purposes, the contractor shall expect to use conventional earth-moving equipment

for the excavation of Units 1, 2 and 3 and expect the need for larger equipment, such as hoe-rams and large excavator, for Unit 4. The seismic refraction reports by GEOVision and Norcal (Appendices C and D) have more information regarding the excavatability of the bedrock and shall be reviewed by excavation contractor prior to bidding on the project.

For baseline purposes, the contractor shall expect heavier equipment, such as hoe-rams and large excavators, will be required to remove any remnants of buried foundations or walls from previous buildings that might have occupied the site, or of the existing facilities that interfere with the proposed development. The contractor shall review as built drawings of the existing foundation system and walls to estimate the volume of concrete and assume that they will need to use heavier equipment to remove them.

When preparing the subgrade for the spread footings, areas of loose or disturbed soil may be encountered in localized areas. If loose areas are encountered, the loose material shall be removed and replaced with either lean or structural concrete.

During excavation, the contractor shall expect groundwater will be perched on top of bedrock or in the fractures. The contractor shall expect the portions of the excavations for the basement and lower-level work area that will be in exposed bedrock will require a system of sumps and collection trenches. The contractor shall be familiar with any permit requirements and fees for the installation of wells and for disposal of the groundwater.

Even with active dewatering, wet, disturbed subgrade soil/rock could be exposed at the bottom of excavations and require stabilization prior to placement of improvements. For baseline purposes, the contractor shall expect that in order to stabilize the subgrade, the wet and disturbed subgrade shall be overexcavated and replaced with a lean concrete rat slab.

For drilled shafts, if more than six inches of water is present during concrete placement, either the water shall be pumped out or the concrete be placed into pier shafts using the tremie method and/or a pumper pipe. Concrete shall be placed from the bottom up in a single operation. The tremie pipe shall be maintained at least five feet below the upper surface of the concrete during casting of the piers. To develop the design skin friction value provided in the geotechnical investigation report (Langan, 2023), concrete used for pier construction shall have a slump between seven and nine inches. As the concrete is placed, casing used to stabilize the hole can be withdrawn. The bottom of the casing shall be maintained at least three feet below the surface of the concrete.

7.4 Shoring

Where space permits, excavations shallower than five feet may be vertical; however, for deeper excavations, adjacent improvements shall be retained by temporary shoring during excavation for the basement and construction of the building in accordance with the Occupational Safety and Health Administration (OSHA) standards (29 CFR Part 1926). There are several key considerations in selecting a suitable shoring system. Those we consider to be primary concerns are:

- reuse of existing walls along the perimeter of the site to provide temporary support;
- protection of surrounding improvements including the existing streets and buildings;
- ease of installation;
- proper installation of the shoring system to reduce the potential of ground movement, and
- construction cost.

Currently, the site has retaining walls along the northwest, north and northeast property line. The shoring designer shall consider reusing the existing retaining walls as part of their shoring system if they do not interfere with the proposed improvements and are considered structurally sound.

If the existing walls cannot be used as shoring, there are several methods of providing lateral support for the excavation including sheet piles, soldier piles and lagging and soil nailing. Sheet piles are difficult to install into the dense Colma Formation (Unit 3) sand and bedrock (Unit 4). The presence of cohesionless soil precludes soil nailing the entire excavation. Therefore, considering the depths of the proposed cuts, expected soil conditions and our past experiences, soldier pile and lagging system with tiebacks shall be considered the baseline shoring system for the project by the contractor. The presence of sand and bedrock may cause some difficulty with installation of the soldier piles and tiebacks. However, this system has been successfully used in a number of major projects in the vicinity of this site with similar subsurface conditions.

A soldier-pile-and-lagging system consists of concrete encased steel beams placed in predrilled holes extending below the bottom of the excavation. Wood lagging is placed between the piles as the excavation proceeds. Shoring will require tiebacks or internal bracing for lateral support if a cantilever shoring system is not appropriate for the basement excavation.

The shoring system selected shall be designed by a civil engineer knowledgeable in the specific type of construction. The shoring contractor shall select the shoring system based on the subsurface conditions.

Because of the presence of loose to medium dense sand, steel piles shall not be vibrated into place. Our experience has shown that vibration causes settlement of sand and distress to existing improvements. Steel piles shall be placed in predrilled holes backfilled with concrete. For baseline purposes, the contractor shall expect that drilling of the shafts for the soldier piles will require casing and/or the use of slurry to prevent caving of sand layers. If water is encountered in the shafts or drilling mud is used, concrete shall be placed by tremie method. The contractor shall expect drilling of the holes for the soldier beams in the bedrock will be problematic where hard competent rock is encountered. Because the tiebacks will extend beneath the public streets and adjacent buildings, the contractor shall expect encroachment permits will be required. The contractor shall expect deep utility vaults present beneath sidewalks and streets, which will limit the use of tiebacks or require them to.

Where space allows, temporary slopes may be used. Temporary slopes shall not be steeper than 1.5:1 (horizontal to vertical) for slopes up to 10 feet in height. The contractor shall anticipate where temporary slopes are greater than 10 feet, the temporary slopes shall be analyzed on a case-by-case basis by the geotechnical engineer for factor of safety (FS) of at least 1.3. Vertical cuts can be used where the excavation is less than four feet, but the contractor shall expect soil to slough or not remain vertical where cohesionless soil is encountered. The contractor shall remove soil which sloughs into an excavation.

If there is insufficient space to slope the excavation, then a shoring system shall be used to retain the sides of the excavations. Because the depth of the excavations for the basement on the western portion of the site will be on the order of 20 feet, which will require a retained height of 21 to 44 feet, the contractor shall expect the shoring be tied back or internally braced.

7.5 Site Preparation and Earthwork

For baseline purposes, the contractor shall expect that demolition in areas to be developed shall include removal of existing pavement, utility lines, wells, and underground obstructions, including foundations of existing structures. Any vegetation and organic topsoil shall be stripped in areas to receive new site improvements. Stripped organic soil shall be stockpiled for later use in landscaped areas, if approved by the owner and architect; organic topsoil shall not be used as compacted fill.

For baseline purposes, the contractor shall expect brick, rock, concrete, old foundations, and other building rubble will be encountered in the fill (Unit 1). The fill (Unit 1) is likely contaminated and special handling and disposal may be required; the contractor shall review available environmental reports. The contractor shall expect installation of shoring and foundations and excavation will also be difficult in some areas of the site as a result of the obstructions in the fill. In addition, the contractor shall expect serpentinite bedrock containing naturally occurring asbestos (NOA) will be encounter when excavating for footings, the basement level and lower-level work area. Detailed discussion regarding NOA is presented in Section 6.3 and the monitoring for NOA is presented in Section 8.2.

From a geotechnical standpoint, asphalt and concrete removed from the site may be crushed and reused, provided it is free of organic material and rocks or lumps greater than three inches in greatest dimension. The acceptability of using crushed asphalt at the site shall be verified by the property owner, architect, and environmental consultant. Where crushed asphalt pavement materials are used, particles between 1½ and 3 inches in greatest dimension shall comprise no more than 20 percent of the fill by weight.

Where utilities to be removed extend off site, they shall be capped or plugged with grout at the property line. It may be feasible to abandon utilities in-place, provided they will not impact future utilities or building foundations. If utilities are abandoned in-place, they shall be completely filled with flowable cement grout over their entire length. Existing utility lines encountered during construction shall be addressed on a case-by-case basis. However, for baseline purposes, the contractor shall expect existing utilities within four feet of final grades shall be removed, and the resulting excavation shall be properly backfilled.

Where the proposed improvements are to be supported on drilled piers, it will be necessary to remove any obstructions that will interfere with installation of the drilled piers and construction of the footings, pier caps and grade beams. It may be possible to leave some obstructions in place; however, this shall be determined on a case-by-case basis. Excavations resulting from demolition activities shall be backfilled accordingly.

Loose to medium dense sands or gravels are present in the surficial soils. Heavy equipment is typically required to install drilled piers. This type of equipment can disturb the subgrade and may require that the subgrade be winterized or repaired after installation of the drilled pier elements. The contractor shall expect vertical excavations in sand to not be stable and will need to be formed. If caving of footings, pier caps or grade beams occur, the excavation will need to be cleaned out prior to pouring concrete.

8.0 INSTRUMENTATION AND MONITORING

A monitoring program shall be established to evaluate the effects of the construction on the adjacent improvements. The contractor shall install surveying points to monitor the movement of shoring, adjacent improvements, and settlement of the adjacent ground surface during below-grade construction activities. The shoring system and adjacent improvements shall be monitored for movements throughout the excavation and at least until the ground-level slab is cast. Details regarding the location and frequency of the monitoring is presented in the following subsections.

8.1 Ground Movement Monitoring

The conditions of existing buildings within 100 feet of the site shall be photographed and surveyed prior to the start of construction and monitored periodically during construction. A thorough crack survey of the adjacent buildings, especially those surrounding the proposed excavation shall be performed prior to the start of construction and immediately after its completion.

The purpose of these observations is to provide photographic and/or video documentation representative of general existing conditions, and to identify obvious visual deficiencies. The preconditions observations shall also identify areas requiring specific monitoring during construction. Structural integrity is not addressed in such documentation. This baseline information is often critical in the event of future damage claims resulting from construction activities. The preconstruction conditions documentation shall be used to inform an observational and instrumentation monitoring program that can be used to evaluate the performance of adjacent structures and construction procedures.

To monitor ground movements and shoring movements during the excavation activities, the contractor shall install the instrumentation listed below:

Slope inclinometers: For baseline purposes, the contractor shall install slope inclinometers adjacent to the proposed shoring system. The number of inclinometers will be determined once the location of the temporary shoring system has been finalized. However, for baseline purposes, the contractor shall expect to install two inclinometers behind each shoring wall. The slope inclinometers shall be installed following the installation of the shoring walls and prior to excavation. Langan shall obtain inclinometer readings regularly. Initially, depending upon the speed of excavation, the instrumentation shall be read weekly. The frequency of readings may, in the later stage of construction, be modified as appropriate.

Survey points: Survey points shall be installed on the adjacent streets and improvements that are within 100 feet of the proposed excavation. In addition, survey points shall be installed at the tops of the shoring walls at 20-foot-spacing. These points shall be used to monitor the vertical and horizontal movements of the shoring and these improvements. These points shall be selected with the help of the geotechnical engineer, so they can provide the most value to the project. The survey shall be read regularly, and the results shall be submitted to us in a timely manner for review. For estimating purposes, assume that the survey points will be read as follows:

- prior to any shoring work at the site;
- after installing soldier piles;
- after excavation of each lift;
- after the excavation reaches the planned excavation level;
- every two weeks until the street-level floor slab is constructed.

8.2 NOA

As discussed in Section 6.3, the site will be subject to the CARB Asbestos Airborne Toxic Control Measure (ATCM) for construction, grading, quarrying, and surface mining operations dated July 2001 during redevelopment. Also, the project will be required to install a perimeter dust air monitoring network. Upon completion of construction grading and post-construction stabilization, a written closure request is submitted to BAAQMD, and a final district approved site inspection is completed. Based on the discovery of serpentinite, the subsurface lithology beneath the site, and proposed excavation activities, Langan recommends notifying BAAQMD on the discovery of serpentinite at the site and the preparation of an ADMP for BAAQMD review and approval for regulatory compliance prior to construction.

In addition, Langan recommends that the project team consult with a Certified Industrial Hygienist (CIH) to provide health and safety recommendations for potential worker exposure to NOA per California Occupational Safety and Health Administration (OSHA) requirements. Based on our experience on other NOA construction projects in the San Francisco Bay Area, the health and safety recommendations provided by a CIH shall include the following:

- Update the site-specific Health and Safety Plan (HASP) to address the presence of NOA at the site.
- Perform NOA worker training for each trade performing activities in or disturbing NOA.

In our experience, training must be conducted for each applicable subcontractor and individual employees working in NOA or with potential exposure to NOA.

- Perform a series of negative exposure assessments (i.e., personal air monitoring) for each activity and each subcontractor disturbing NOA (excavation and grading, foundation work, etc.).

- During the initial personal air monitoring, personnel protective equipment (PPE) is typically upgraded to Level C (as determined by the CIH). The CIH will work with the subcontractors to determine which activities require personal air monitoring. This typically needs to be repeated for each subcontractor and each new activity.

- Document acceptable personal air monitoring results below the OSHA permissible exposure limit (PEL) for asbestos and deescalate PPE to Level D (if monitoring results are below the OSHA PEL) For baseline purposes, the contractor shall expect that if monitoring results are elevated above OSHA PELs, the CIH will recommend that Level C PPE remain in place until monitoring results indicated acceptable air quality for workers.

A CIH will be able to provide more details on hazard notification and appropriate Cal OSHA compliance requirements. Langan recommends consulting with a CIH before continuing any work in potential areas containing NOA.

REFERENCES

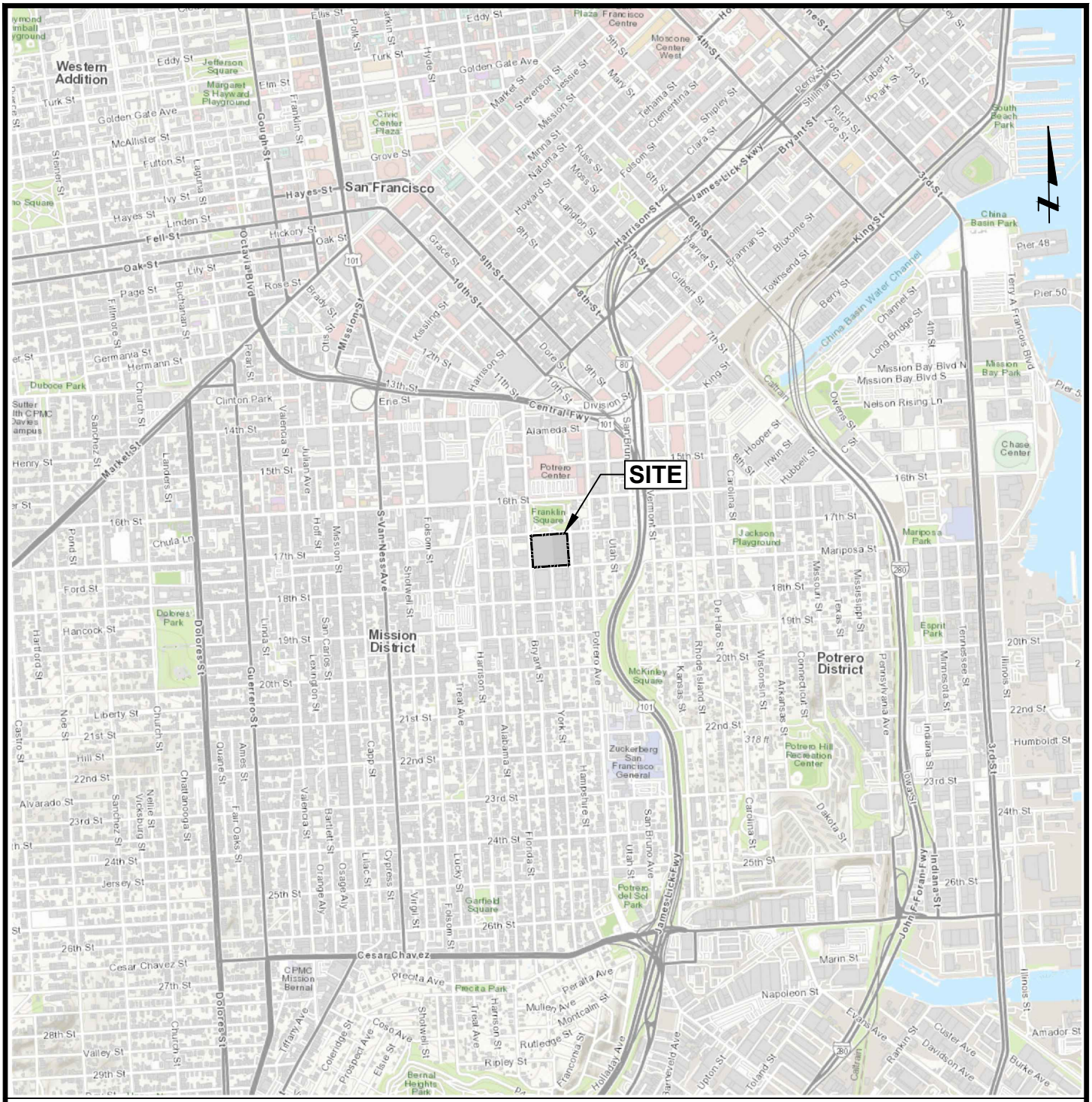
Arup/RYCG A Joint Venture (2019). "San Francisco Public Works, SFMTA Potrero Facility Rebuild, Geotechnical Engineering Report."

IBI Group (2023). "Potrero Yard Modernization Project 50% Schematic Design," dated 3 May 2023.

Schlocker, J. (1958). "Geology of the San Francisco North Quadrangle, California."

Subsurface Consultants, Inc. (1990). "Geotechnical Investigation, Renovation and Seismic Upgrade, Muni Potrero Facility, Mariposa and Hampshire Street, San Francisco, California." SCI 473.002 dated 25 September 1990.

FIGURES



Note:
Base map is provided through Langan's Esri Arc GIS software licensing and Arc GIS online.
Credits: Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN.

DRAFT

0 2,000 Feet

Approximate scale

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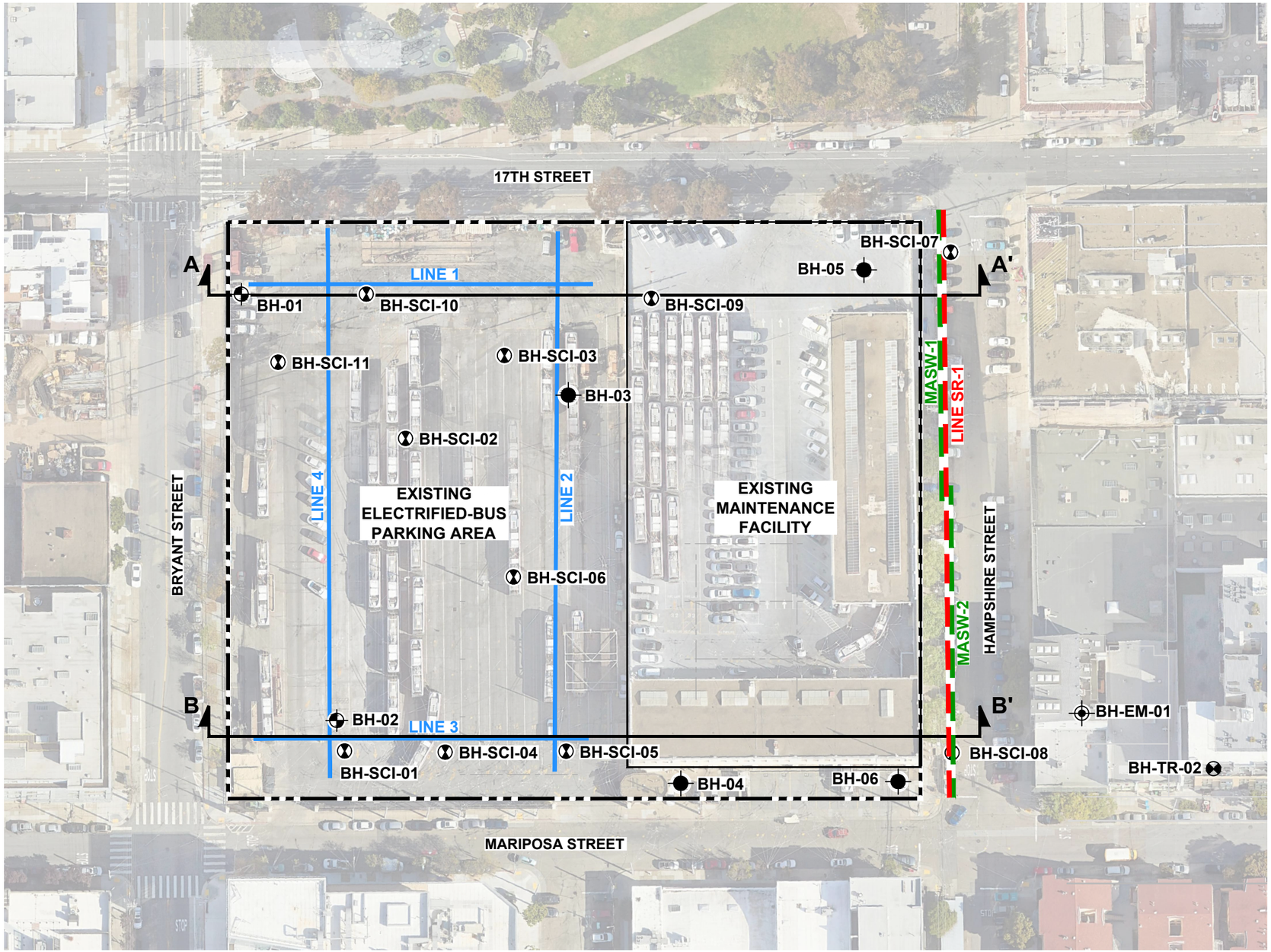
Project	Figure Title	Project No.	Figure
SFMTA POTRERO FACILITY REBUILD SAN FRANCISCO SAN FRANCISCO COUNTY CALIFORNIA	SITE LOCATION MAP	770691701 Date 03/11/2024 Drawn By AG Checked By JN	1

Filename: \\langan.com\data\SJO\data7\770691701\Project Data\CAD_01\01\2D-DesignFiles\Geotechnical\770691701-B-GI0102_SiteLocMap.dwg Date: 3/11/2024 Time: 10:06 User: agekas Style Table: Langan.stb Layout: Figure 1 Site Loc



EXPLANATION

- BH-01 — Approximate location of deep boring by Arup, March 2018
- BH-03 — Approximate location of shallow boring by Arup, March 2018
- BH-TR-02 — Approximate location of boring by Treadwell & Rollo, Inc., December 2004
- BH-EM-01 — Approximate location of boring by Earth Mechanics, July 1998
- BH-SCI-01 — Approximate location of boring by Subsurface Consultants, Inc., January 1989
- LINE 1 — Approximate location of surface wave geophysics line by GEOVision Geophysical Services, Inc, March 2018
- LINE SR-1 — Approximate location of seismic refraction line by NORCAL Geophysical Consultants, Inc., April 2023
- MASW-1 — Approximate location of surface wave geophysics line by NORCAL Geophysical Consultants, Inc., April 2023
- A A' — Interpretive cross section location
- Site boundary

Reference: Aerial by Google Earth Pro 2023.

DRAFT

0 80 Feet

Approximate scale

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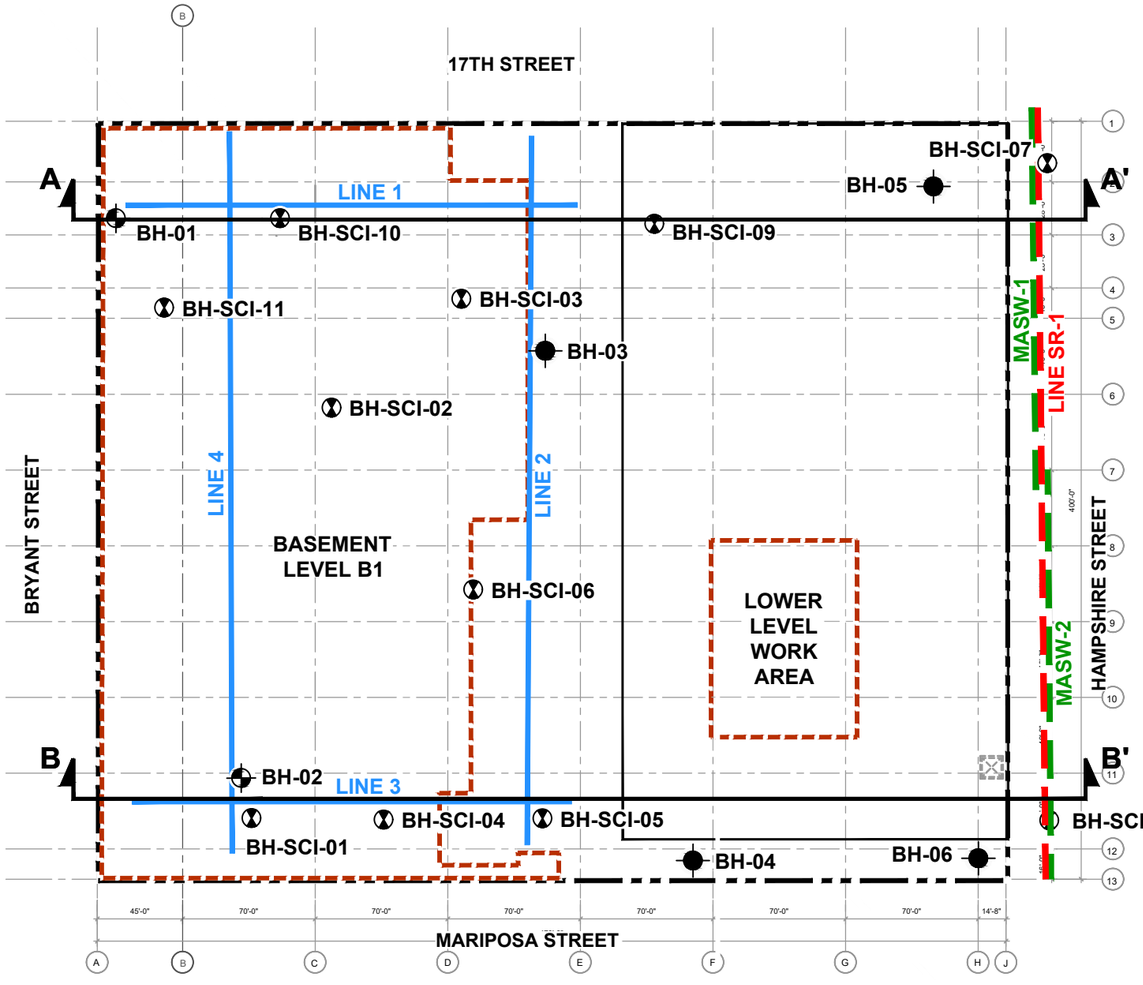
Project
SFMTA POTRERO FACILITY REBUILD
SAN FRANCISCO
SAN FRANCISCO COUNTY CALIFORNIA

Figure Title
SITE PLAN WITH EXISTING CONDITIONS

Project No. 770691701
Date 06/04/2024
Drawn By AG
Checked By JN

Figure No. 2

Filename: \\langan.com\data\SJO\data7\770691701\Project Data\CAD_01\01\2D-DesignFiles\Geotechnical\770691701-B-SP0102_For Letter Report.dwg Date: 6/5/2024 Time: 09:35 User: agekas Style Table: Langan.stb Layout: Site Plan Fig 2



EXPLANATION

BH-01	Approximate location of deep boring by Arup, March 2018
BH-03	Approximate location of shallow boring by Arup, March 2018
BH-TR-02	Approximate location of boring by Treadwell & Rollo, Inc., December 2004
BH-EM-01	Approximate location of boring by Earth Mechanics, July 1998
BH-SCI-01	Approximate location of boring by Subsurface Consultants, Inc., January 1989
LINE 1	Approximate location of surface wave geophysics line by GEOVision Geophysical Services, Inc, March 2018
	Footprint of proposed basement (Level B1) and lower level work area (Note 1)
LINE SR-1	Approximate location of seismic refraction line by NORCAL Geophysical Consultants, Inc., April 2023
MASW-1	Approximate location of surface wave geophysics line by NORCAL Geophysical Consultants, Inc., April 2023
A A'	Interpretive cross section location
	Site boundary

Note: 1. The footprint of proposed basement (Level B1) and lower level work area is approximate and should not be relied upon for bidding or construction.

DRAFT

Reference: Base drawings provided by IBI Group titled "Potrero Yard Modernization Project 50% Schematic Design", dated 05/03/2023, Sheet No. A1001 titled "SITE PLAN".

0 80 Feet

Approximate scale

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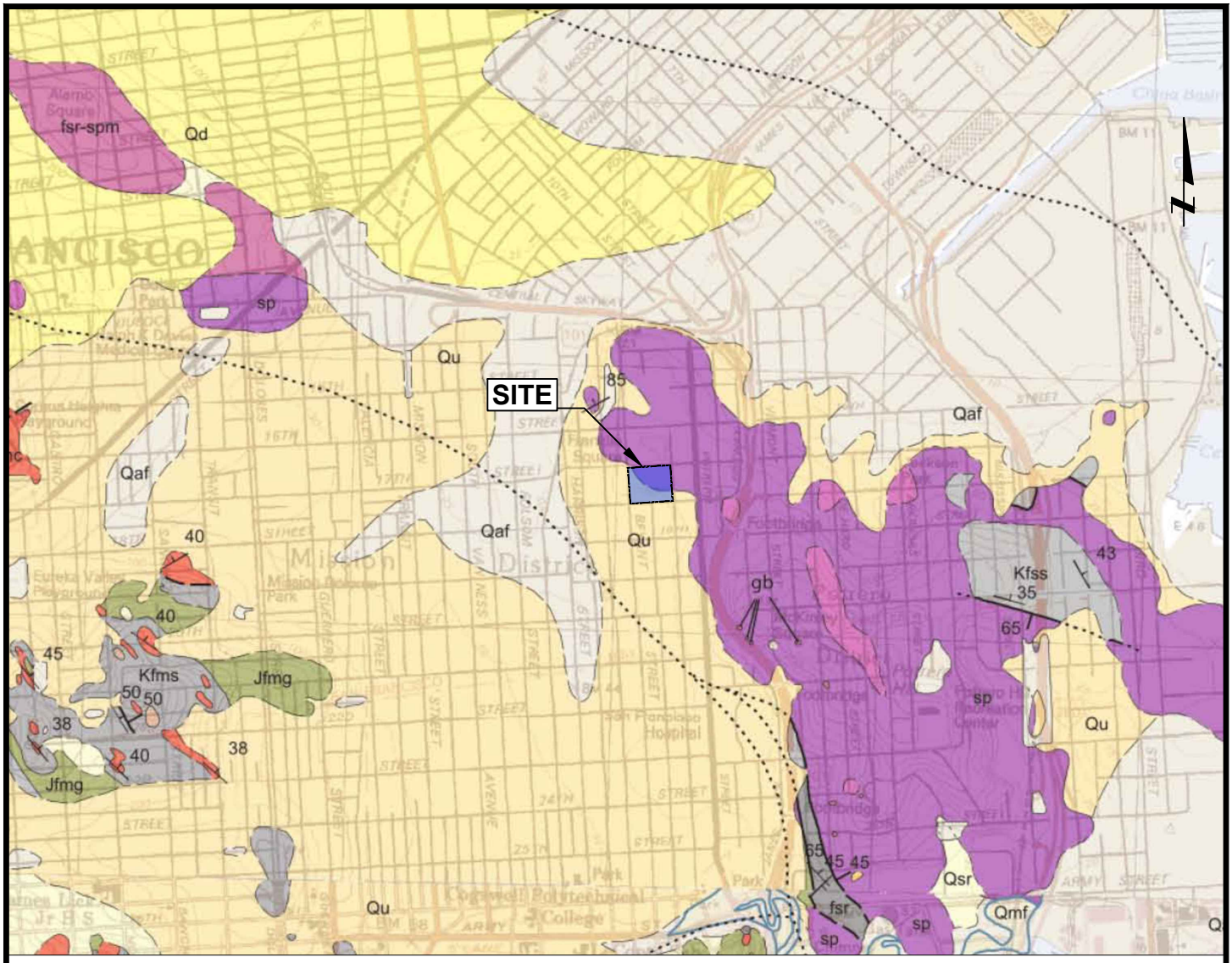
Project	SFMTA POTRERO FACILITY REBUILD SAN FRANCISCO SAN FRANCISCO COUNTY CALIFORNIA
Figure Title	SITE PLAN WITH PROPOSED DEVELOPMENT
Project No.	770691701
Date	06/04/2024
Drawn By	AG
Checked By	JN
Figure No.	3

Filename: \\langan.com\data\SJO\data7\770691701\Project Data\CAD_01\01\2D-DesignFiles\Geotechnical\770691701-B-SP0102_For Letter Report.dwg Date: 6/5/2024 Time: 09:36 User: agekas Style Table: Langan.stb Layout: Site Plan Fig 3



EXPLANATION

Qaf	Artifical fill
Qmf	Artificial fill over bay mud
Qd	Dune sand
Qsr	Slope and ravine fill
Qu	Undifferentiated surficial deposits
Kfss	Franciscan(?) sandstone
fsr	Sheared sandstone and shale with small blocks of other rock (Melange)
fsr-spm	Intermixed serpentinite and sheared sandstone and shale
sp	Serpentinite with small blocks of other rock
gb	Gabbro
Kjfmc	Chert
Jfmg	Greenstone
Kfms	Sandstone

50 — Strike and dip of bedding

Contact -- Depositional or intrusive contact, dashed where approximately located, dotted where concealed

Fault -- Dashed where approximately located; small dashed where inferred, dotted where concealed; dip value and direction

75

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0 2000 Feet

Approximate scale

Base map: Geologic Map of the City and County of San Francisco. Modified from Blake and others (2000); Bonilla (1998; 1971); and Schlocker (1974).

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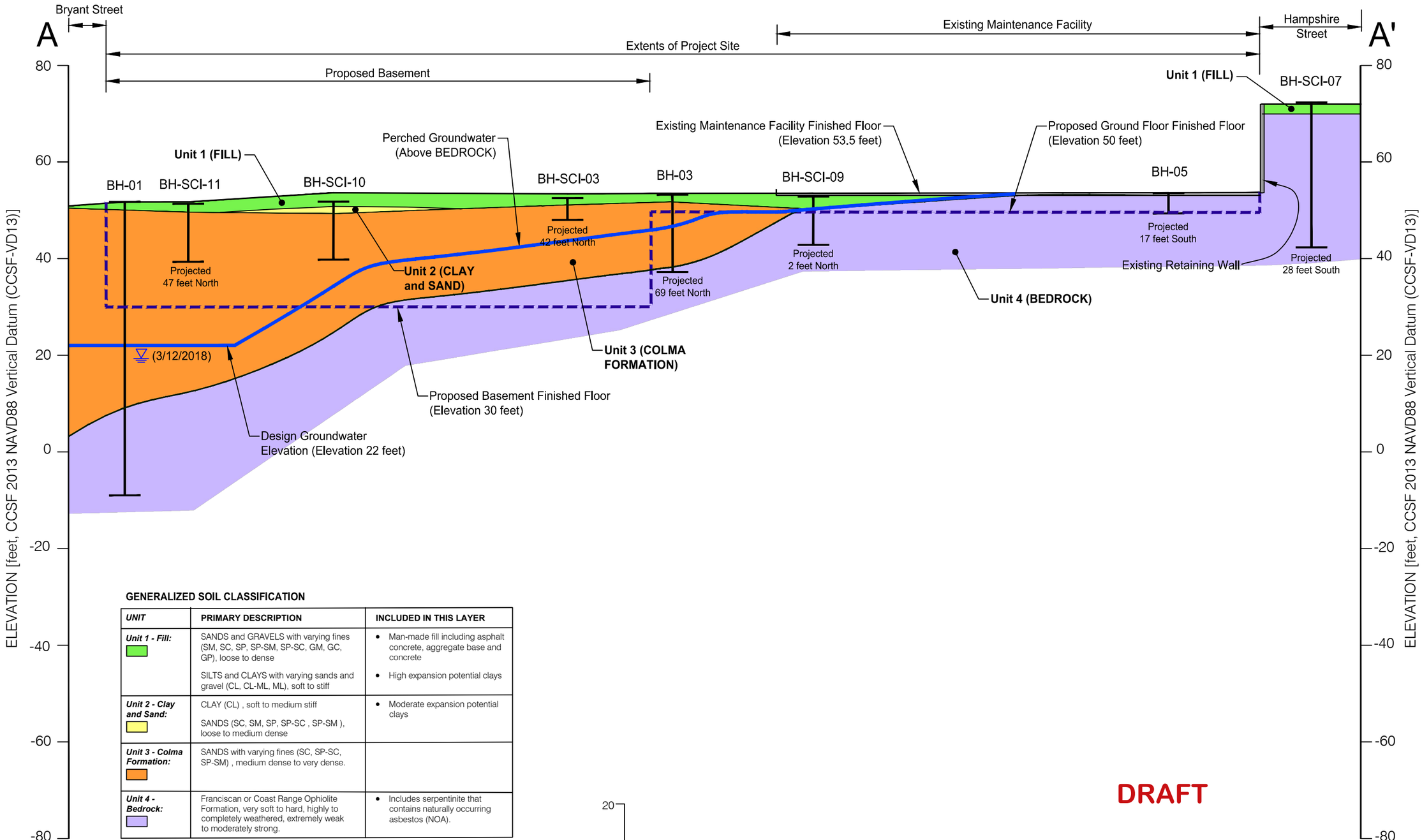
Project
SFMTA POTRERO FACILITY REBUILD
SAN FRANCISCO
SAN FRANCISCO COUNTY CALIFORNIA

Figure Title
REGIONAL GEOLOGIC MAP

Project No. 770691701
Date 03/11/2024
Drawn By AG
Checked By JN

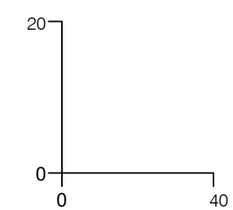
Figure 4

Filename: \\langan.com\data\SJO\data7\770691701\Project Data\CAD_01\01\2D-DesignFiles\Geotechnical\770691701-B-GI0102_SiteLocMap.dwg Date: 3/11/2024 Time: 10:04 User: agekas Style Table: Langan.stb Layout: Figure 4-GeologyMap



GENERALIZED SOIL CLASSIFICATION

UNIT	PRIMARY DESCRIPTION	INCLUDED IN THIS LAYER
Unit 1 - Fill:	SANDS and GRAVELS with varying fines (SM, SC, SP, SP-SM, SP-SC, GM, GC, GP), loose to dense SILTS and CLAYS with varying sands and gravel (CL, CL-ML, ML), soft to stiff	• Man-made fill including asphalt concrete, aggregate base and concrete • High expansion potential clays
Unit 2 - Clay and Sand:	CLAY (CL) , soft to medium stiff SANDS (SC, SM, SP, SP-SC , SP-SM), loose to medium dense	• Moderate expansion potential clays
Unit 3 - Colma Formation:	SANDS with varying fines (SC, SP-SC, SP-SM) , medium dense to very dense.	
Unit 4 - Bedrock:	Franciscan or Coast Range Ophiolite Formation, very soft to hard, highly to completely weathered, extremely weak to moderately strong.	• Includes serpentinite that contains naturally occurring asbestos (NOA).



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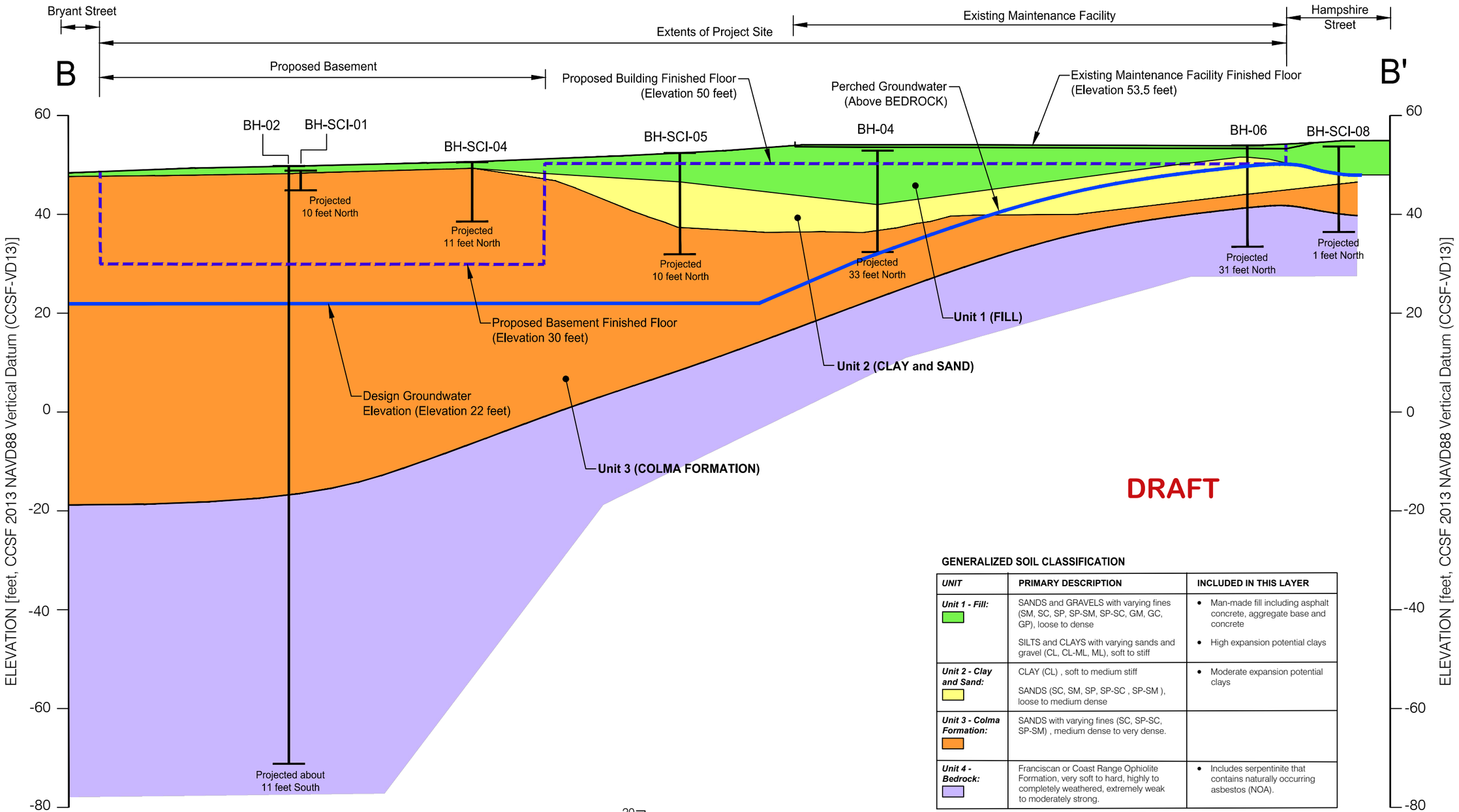
Project: SFMTA POTRERO FACILITY REBUILD
SAN FRANCISCO
SAN FRANCISCO COUNTY CALIFORNIA

Figure Title: INTERPRETIVE SUBSURFACE PROFILE A-A'

Project No.	770691701
Date	06/04/2024
Drawn By	AG
Checked By	JN
Figure No.	5

Filename: \\langan.com\data\SJO\data7\770691701\Project Data\CAD_01\01\2D-DesignFiles\Geotechnical\770691701-B-XS0101_In Colors.dwg Date: 6/5/2024 Time: 09:15 User: agekas Style Table: Langan.stb Layout: A-A' (2)



DRAFT

GENERALIZED SOIL CLASSIFICATION

UNIT	PRIMARY DESCRIPTION	INCLUDED IN THIS LAYER
Unit 1 - Fill:	SANDS and GRAVELS with varying fines (SM, SC, SP, SP-SM, SP-SC, GM, GC, GP), loose to dense SILTS and CLAYS with varying sands and gravel (CL, CL-ML, ML), soft to stiff	• Man-made fill including asphalt concrete, aggregate base and concrete • High expansion potential clays
Unit 2 - Clay and Sand:	CLAY (CL) , soft to medium stiff SANDS (SC, SM, SP, SP-SC , SP-SM), loose to medium dense	• Moderate expansion potential clays
Unit 3 - Colma Formation:	SANDS with varying fines (SC, SP-SC, SP-SM) , medium dense to very dense.	
Unit 4 - Bedrock:	Franciscan or Coast Range Ophiolite Formation, very soft to hard, highly to completely weathered, extremely weak to moderately strong.	• Includes serpentinite that contains naturally occurring asbestos (NOA).

20
0
0 40
APPROXIMATE SCALE IN FEET

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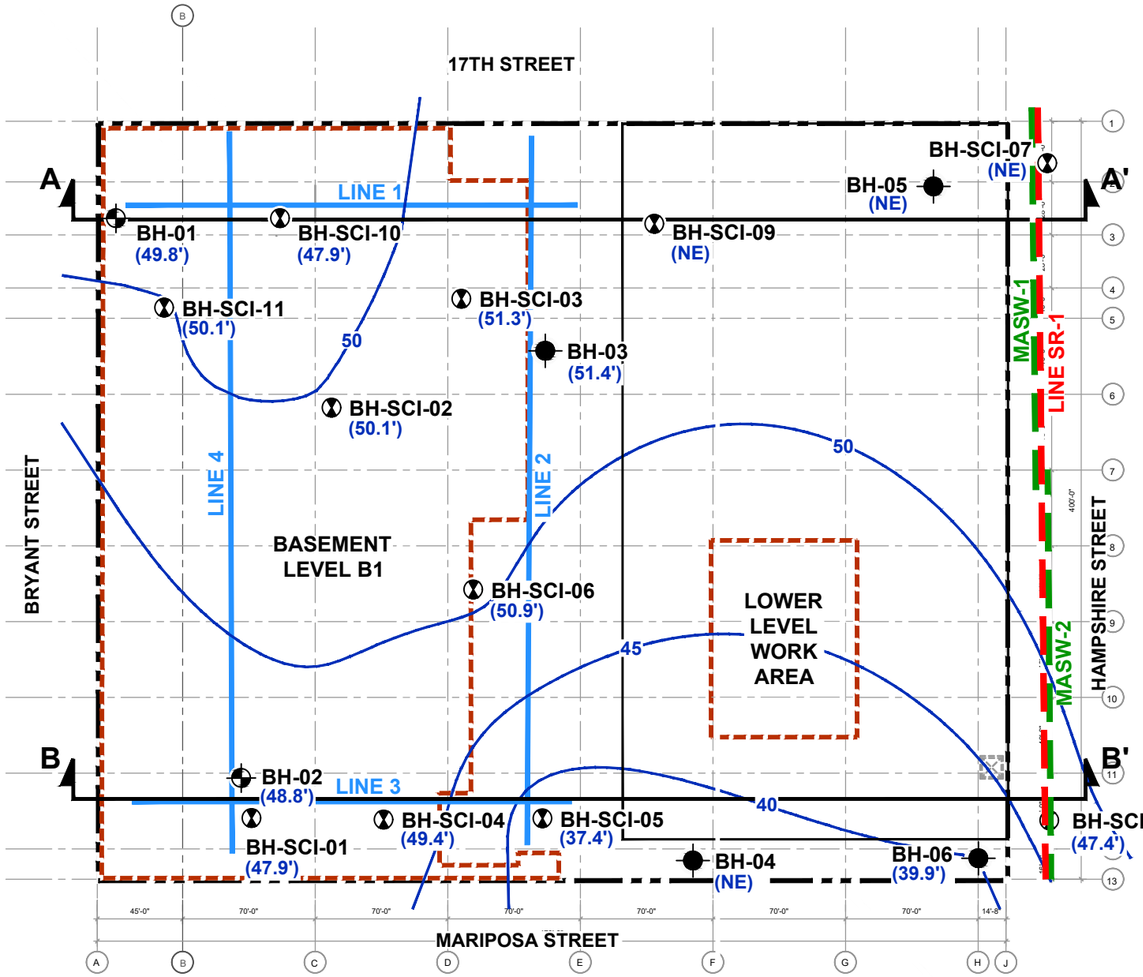
Figure Title
INTERPRETIVE SUBSURFACE PROFILE B-B'

Project No.	770691701
Date	06/04/2024
Drawn By	AG
Checked By	JN

Figure No. 6



EXPLANATION

- BH-01 — Approximate location of deep boring by Arup, March 2018
- BH-03 — Approximate location of shallow boring by Arup, March 2018
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- BH-EM-01 — Approximate location of boring by Earth Mechanics, July 1998
- BH-SCI-01 — Approximate location of boring by Subsurface Consultants, Inc., January 1989
- LINE 1 — Approximate location of surface wave geophysics line by GEOVision Geophysical Services, Inc, March 2018
- Footprint of proposed basement (Level B1) and lower level work area
- 50 — Contours of Top of Colma Elevation (feet, CCSF-VD13), Langan 2023
- (49.8') — Top of Colma Elevation (feet, CCSF-VD13), Langan 2023
- LINE SR-1 — Approximate location of seismic refraction line by NORCAL Geophysical Consultants, Inc., April 2023
- MASW-1 — Approximate location of surface wave geophysics line by NORCAL Geophysical Consultants, Inc., April 2023
- A A' — Interpretive cross section location
- Site boundary

Note: 1. The footprint of proposed basement (Level B1) and lower level work area is approximate and should not be relied upon for bidding or construction.

DRAFT

Reference: Base drawings provided by IBI Group titled "Potrero Yard Modernization Project 50% Schematic Design", dated 05/03/2023, Sheet No. A1001 titled "SITE PLAN"

0 80 Feet

Approximate scale

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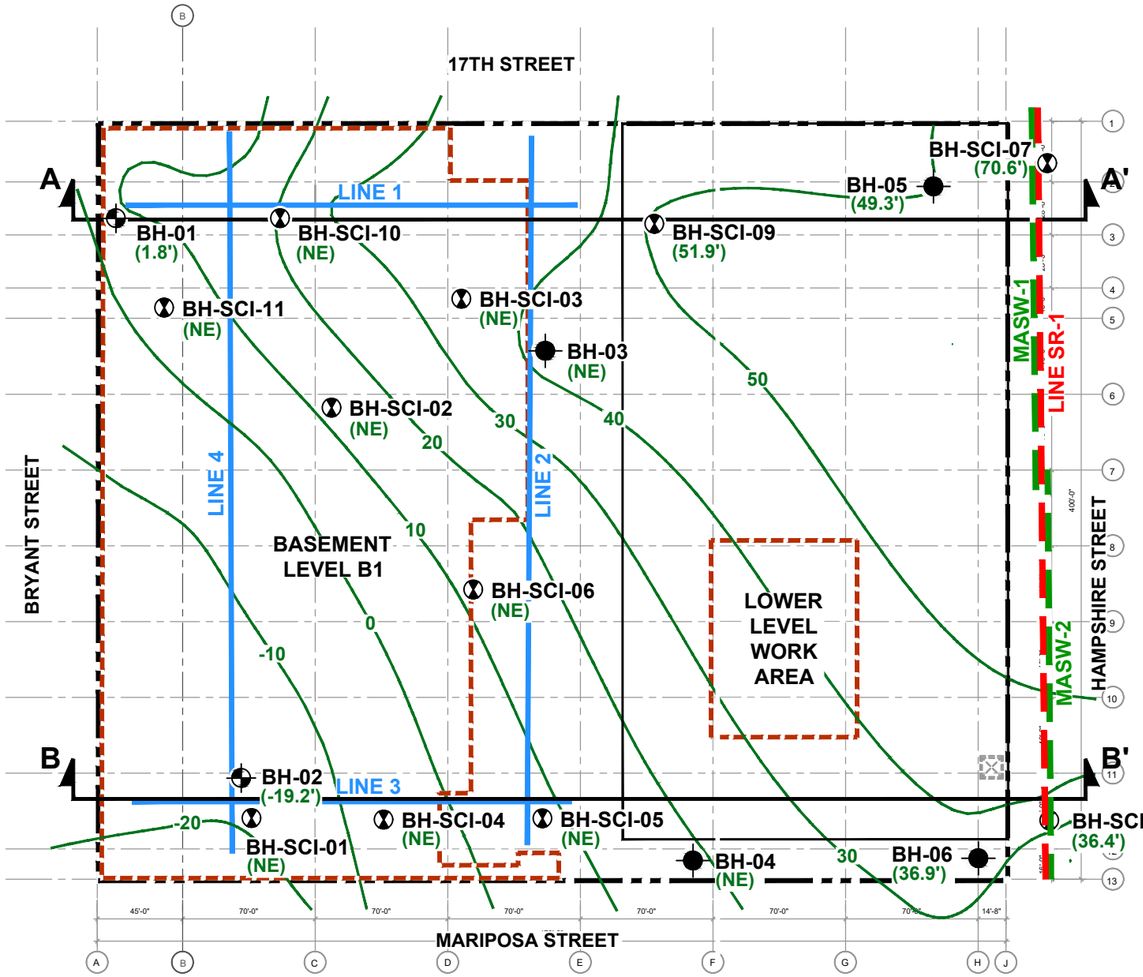
Project	SFMTA POTRERO FACILITY REBUILD SAN FRANCISCO SAN FRANCISCO COUNTY CALIFORNIA
Figure Title	CONTOURS OF TOP OF COLMA ELEVATION
Project No.	770691701
Date	06/04/2024
Drawn By	AG
Checked By	JN
Figure No.	7

Filename: \\langan.com\data\SJO\data7\770691701\Project Data\CAD_01\01\2D-DesignFiles\Geotechnical\770691701-B-SP0102_For Letter Report.dwg Date: 6/5/2024 Time: 09:33 User: agekas Style Table: Langan.stb Layout: Colma Fig 7_2



EXPLANATION

- **BH-01** — Approximate location of deep boring by Arup, March 2018
- **BH-03** — Approximate location of shallow boring by Arup, March 2018
- **BH-TR-02** — Approximate location of boring by Treadwell & Rollo, Inc., December 2004
- **BH-EM-01** — Approximate location of boring by Earth Mechanics, July 1998
- **BH-SCI-01** — Approximate location of boring by Subsurface Consultants, Inc., January 1989
- **LINE 1** — Approximate location of surface wave geophysics line by GEOVision Geophysical Services, Inc, March 2018
- Footprint of proposed basement (Level B1) and lower level work area
- **50** — Contours of Top of Bedrock Elevation (feet, CCSF-VD13), Langan 2023
- **(49.3')** — Top of Bedrock Elevation (feet, CCSF-VD13)
- **LINE SR-1** — Approximate location of seismic refraction line by NORCAL Geophysical Consultants, Inc., April 2023
- **MASW-1** — Approximate location of surface wave geophysics line by NORCAL Geophysical Consultants, Inc., April 2023
- **A A'** — Interpretive cross section location
- Site boundary

Note: 1. The footprint of proposed basement (Level B1) and lower level work area is approximate and should not be relied upon for bidding or construction.

DRAFT

Reference: Base drawings provided by IBI Group titled "Potrero Yard Modernization Project 50% Schematic Design", dated 05/03/2023, Sheet No. A1001 titled "SITE PLAN"

N

0 80 Feet

Approximate scale

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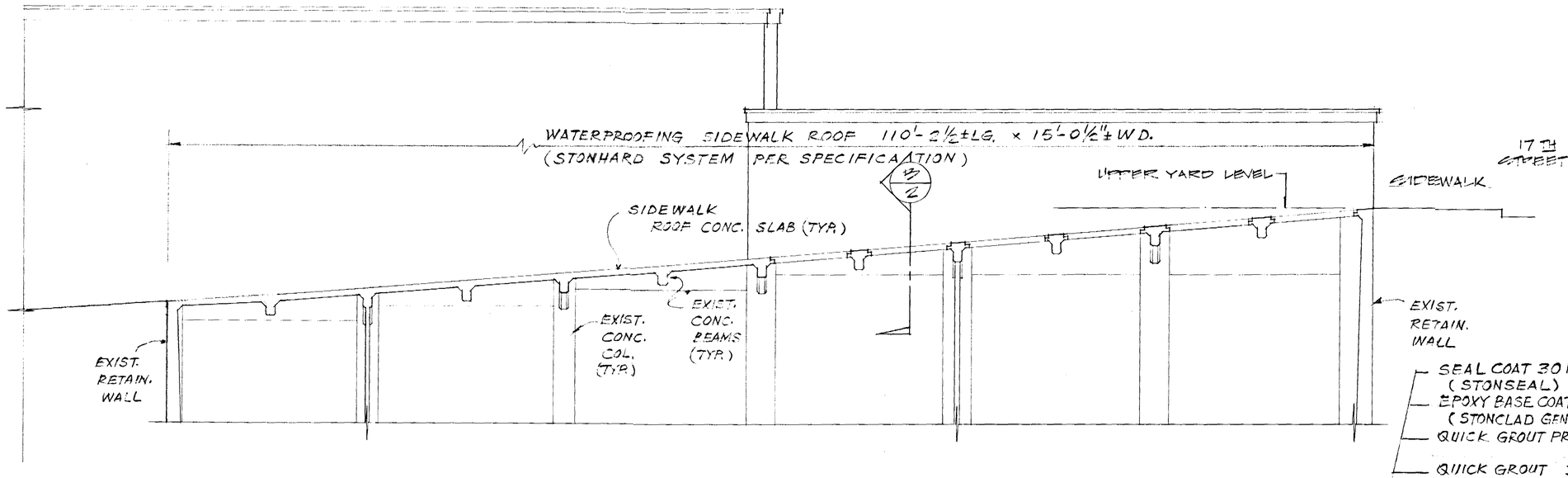
Project	SFMTA POTRERO FACILITY REBUILD SAN FRANCISCO SAN FRANCISCO COUNTY CALIFORNIA
Figure Title	CONTOURS OF TOP OF BEDROCK ELEVATION
Project No.	770691701
Date	06/04/2024
Drawn By	AG
Checked By	JN
Figure No.	8

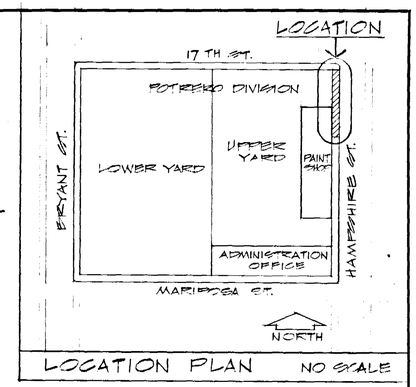
Filename: \\langan.com\data\SJO\data7\770691701\Project Data\CAD_01\01\2D-DesignFiles\Geotechnical\770691701-B-SP0102_For Letter Report.dwg Date: 6/5/2024 Time: 09:31 User: agekas Style Table: Langan.stb Layout: Rock Plan Fig 8 (2)

APPENDIX A

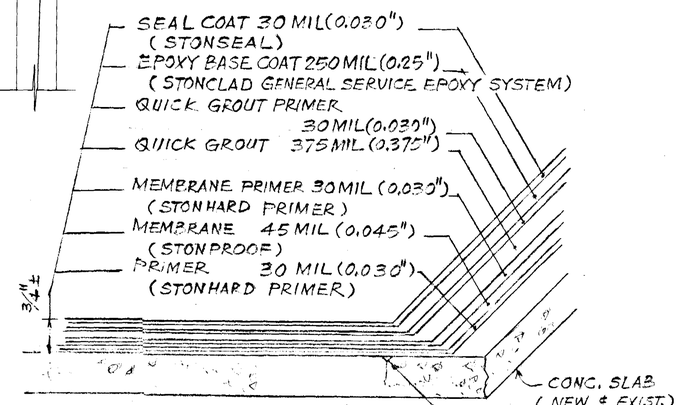
AS-BUILT RECORDS FOR EXISTING RETAINING WALLS



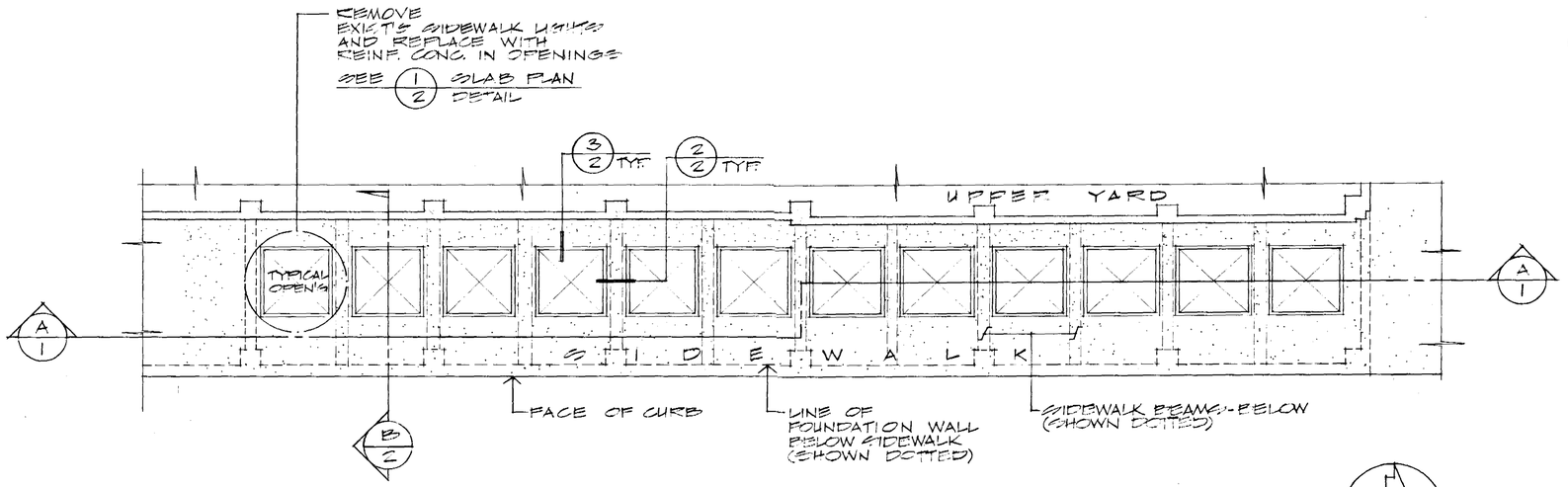
A/1 SECTION / SIDEWALK AND SIDEWALK LIGHTS
(HAMPSHIRE STREET) SCALE - 1/4" = 1'-0"



LOCATION PLAN NO SCALE



1/1 TYPICAL DETAIL
WATERPROOF SYSTEM (STONHARD)
NO SCALE



PLAN
SCALE: 1/8"=1'-0"

Z

CONTRACT NO. M.R. 955

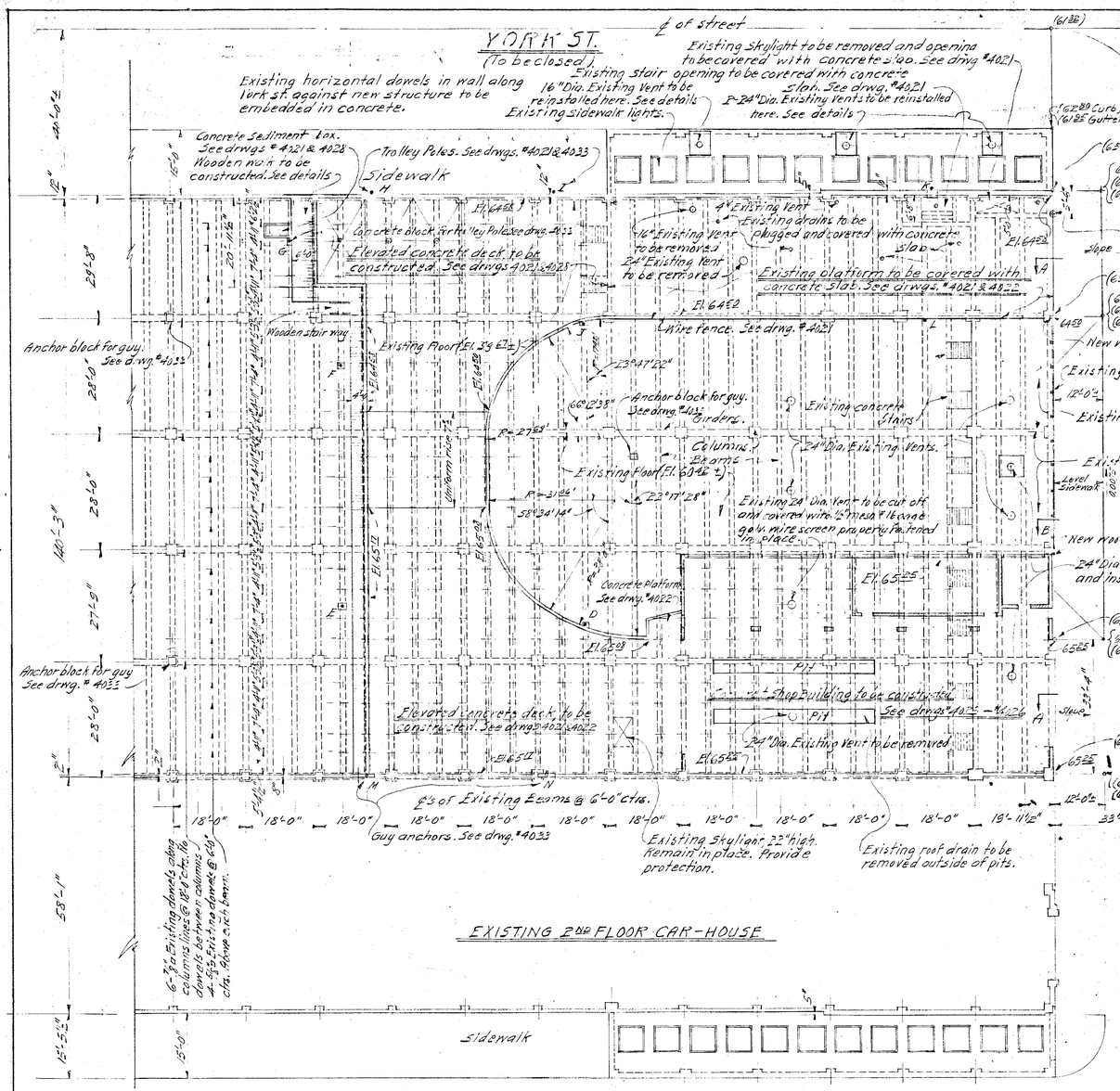
CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
SAN FRANCISCO MUNICIPAL RAILWAY

HAMPSHIRE STREET
SIDEWALK ROOF WATERPROOFING
PLAN & SECTION
17 th & HAMPSHIRE ST., SAN FRANCISCO, CA.

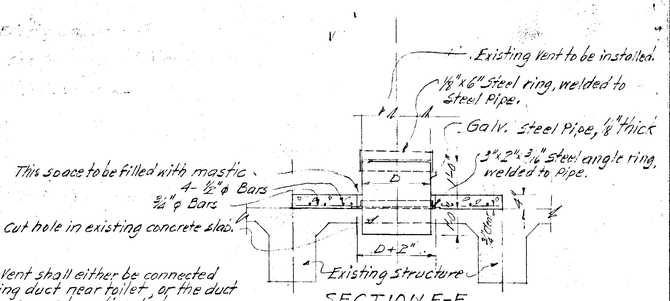
RECOMMENDED	BY	TR. KL	SCALE AS SHOWN
APPROVED	DR. EJ	CH.	DATE 4-23-1936
APPROVED DEPUTY GENERAL MANAGER		DRAWING NO. CL-8344	REVISION NO. C

NO.	DATE	DESCRIPTION	BY	APPR'D.
		REVISIONS		

SHEET 1 OF 2 SHEETS

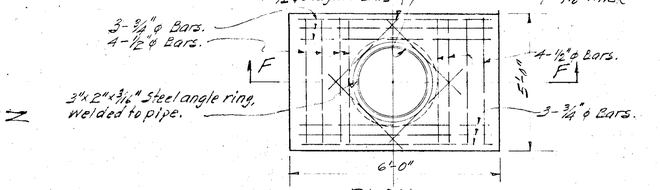


Note: Unless otherwise shown or noted the figures in parenthesis thus (64.82) represent existing elevations or grades. All figures without parenthesis represent finished elevations of proposed work. Trolley pole locations, shown thus E. K etc. For details of anchoring see drwg. #4033.



Note: 16" Vent shall either be connected to existing duct near toilet, or the duct shall be removed, as directed.

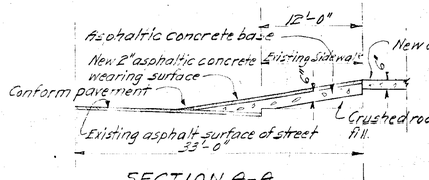
SECTION F-F



PLAN

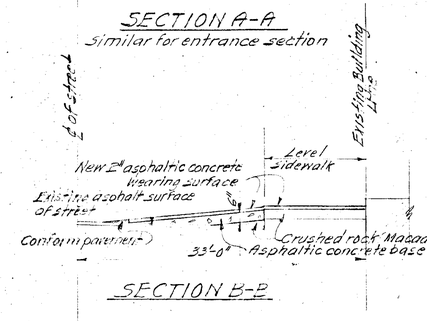
DETAILS FOR REINSTALLING EXISTING VENTS

Scale: ½"=1'-0"



SECTION A-A

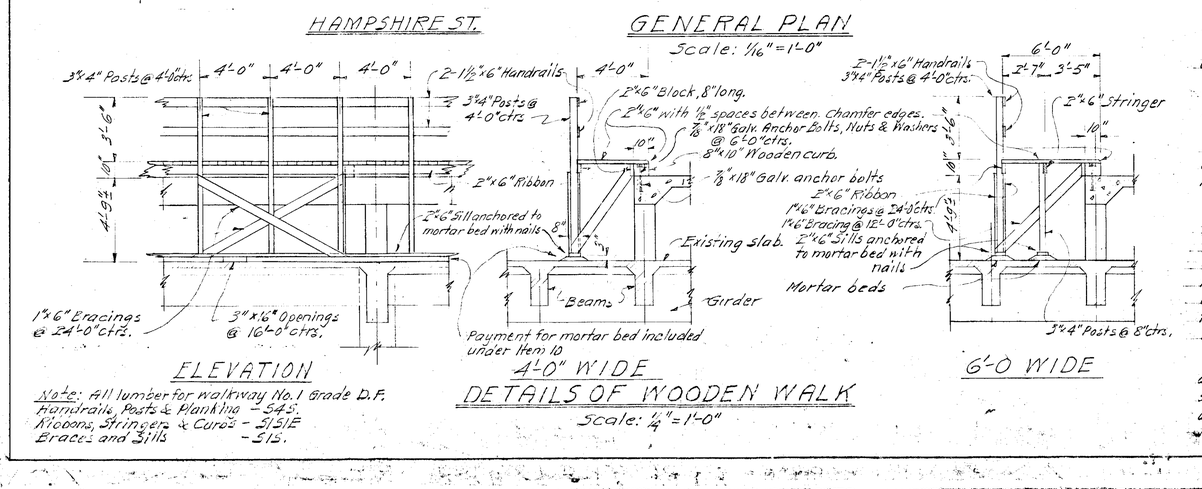
Similar for entrance section



SECTION B-B

LIST OF DRAWINGS

Drawing No.	
4020	General Plan and Details
4021	Elevated Deck - Plan and Concrete Details
4022	Elevated Deck - Concrete Details
4023	Concrete Shop Building - Plan of Substructure
4024	Concrete Shop Building - Plan and Elevations
4025	Concrete Shop Building - Substructure & Building Details
4026	Concrete Shop Building - Roof Plan and Details
4027	Concrete Shop Building - Miscellaneous Details
4028	Plumbing & Piping - Sewer and Drainage Systems.
4029	Plumbing & Piping - Water, Gas, Air & Lubricating Systems
4030	Electrical Work - New Service & Switchboard, Light & Power
4031	Electrical Work - Light & Power for Shop Building
4032	Trolley Service Platform
4033	Trolley Pole Supports and Guy Anchors.



GENERAL NOTES

THESE NOTES APPLY TO ALL DRAWINGS AND GOVERN UNLESS OTHERWISE SHOWN OR NOTED.

DATUM: All elevations shown on the plans are referred to datum, which is a bench mark marked "B.M." on Drawing 4020 and is located 5'-6" east of the northwest corner of the existing building at York St. The assumed elevation of this B.M. is taken as elevation 64.00.

CONSTRUCTION JOINTS: The location and type of all proposed construction joints must be approved by the Engineer prior to starting work. At all construction joints in exterior walls, form keys in face of pour by setting pieces of 2"x4", 1'-6" long every 3'-0" on centers along the center of wall in the freshly poured concrete. The 2"x4" pieces are to be removed after concrete has set.

REINFORCING STEEL: Bars shall be kept apart a clear distance of 1½ diameters at splices and shall NOT be tied together unless such tie is authorized by the Engineer. Stagger adjacent laps wherever practicable.

GENERAL NOTES

COVER OF REINFORCING: The following is the clear distance from face of concrete to reinforcing steel: Walls 1"; Columns and Piers 1" to ties; Beams and Spandrels 1" to Stirrups; 6" and 8" thick Slabs 1"; 4" Slabs ¾"; Top of Parapet 2".

All reinforcing steel shall be rigidly supported away from the forms by means of metal spreaders, and/or the wires. No wall ties or spreaders shall extend closer than 1" to face of concrete.

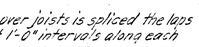
BAR SUPPORTS: Walls reinforced with steel in each face shall have curtain spreaders of not over 4'-0" on centers each way.

Joists shall have 3 "Snap-in" type joist bar chairs per span.

Beams and Girders shall have beam chairs at not over 5'-0" on centers.

All slab steel shall be rigidly supported by means of "Snap-in" type low slab chairs and continuous high chairs.

Where mesh in slabs over joists is spliced the laps shall be tied together at 1'-0" intervals along each edge, staggered, thus:



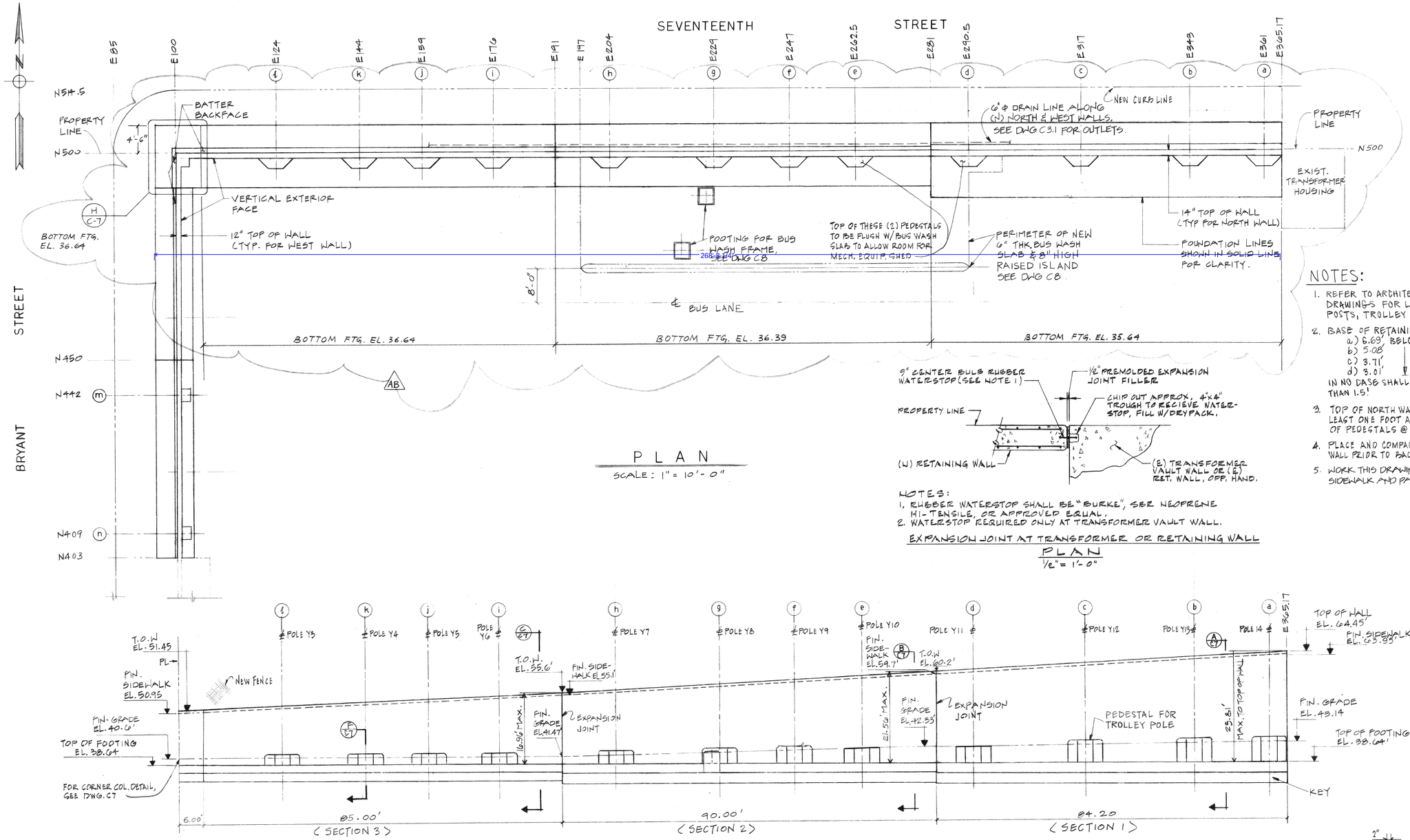
Former Electric Power Bureau No. 4020

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
ELECTRIC POWER BUREAU

ADDITIONS TO 17TH STREET CAR HOUSE
GENERAL PLAN AND DETAILS

SCALE As Shown	BY V. Belkin	DR N. B.	DATE Feb. 1940
APPROVED	CK	CH G. W.	REVISED
APPROVED			DRAWING No. DL-4329

GENERAL MANAGER AND CHIEF ENGINEER



PLAN

SCALE: 1" = 10'-0"

NOTES:
1. RUBBER WATERSTOP SHALL BE "BURKE", SER NEOPRENE HI-TENSILE, OR APPROVED EQUAL.
2. WATERSTOP REQUIRED ONLY AT TRANSFORMER VAULT WALL.

EXPANSION JOINT AT TRANSFORMER OR RETAINING WALL

PLAN

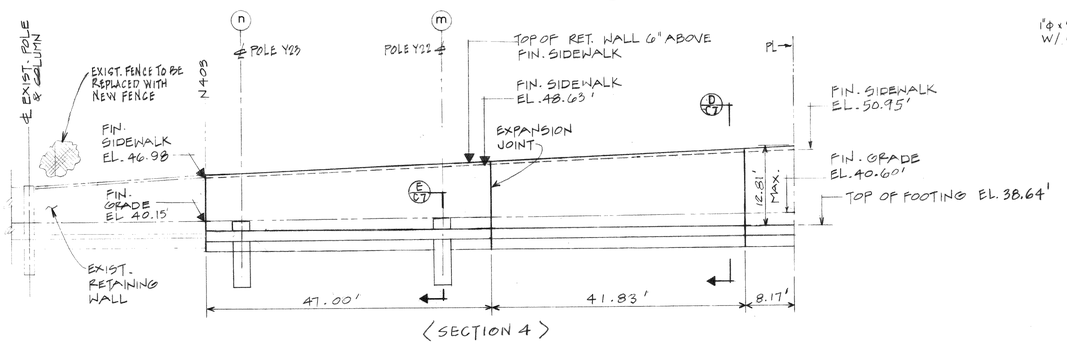
½"=1'-0"

NOTES:

1. REFER TO ARCHITECTURAL, OVERHEAD, AND ELECTRICAL DRAWINGS FOR LOCATION AND/OR SIZE OF FENCE POSTS, TROLLEY POLES AND LIGHT POLES.
2. BASE OF RETAINING WALL FOOTING TO BE AT LEAST
   a) 6.69' BELOW FINISHED GRADE FOR SECTION 1
   b) 5.08' 2
   c) 3.71' 3
   d) 3.01' 4
   IN NO CASE SHALL SOIL COVER, ON THE YARD SIDE BE LESS THAN 1.5'
3. TOP OF NORTH WALL TROLLEY POLE PEDESTALS TO BE AT LEAST ONE FOOT ABOVE FINISH GRADE WITH THE EXCEPTION OF PEDESTALS @ E262.5 & @ E290.5
4. PLACE AND COMPACT BACKFILL IN FRONT OF THE RETAINING WALL PRIOR TO BACKFILLING BEHIND THE WALL.
5. WORK THIS DRAWING WITH DWG C3.1 FOR TOP OF FINISHED SIDEWALK AND PAVEMENT ELEVATIONS.

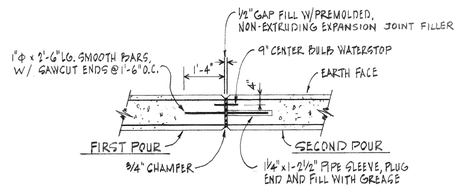
YARD ELEVATION LOOKING NORTH

SCALE: 1" = 10'-0"



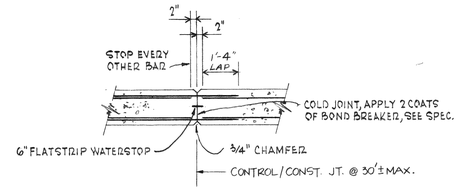
YARD ELEVATION LOOKING WEST

SCALE: 1" = 10'-0"



PLAN - EXPANSION JOINT

SCALE: ½" = 1'-0"



PLAN - CONTROL/CONSTRUCTION JOINT

SCALE: ½" = 1'-0"

C-6

CONTRACT NO. MR-869

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
UTILITIES ENGINEERING BUREAU

MUNI-POTRERO DIV. REHABILIATION

RETAINING WALL PLAN & ELEVATIONS

RECOMMENDED: DESIGNED BY JF | DR. IS/GP | SCALE AS SHOWN
APPROVED: CHECKED BY JC | TR. | DATE 11-1-89
APPROVED: for D.P.W. MANAGER UTILITIES ENGINEERING BUREAU
APPROVED: GENERAL MANAGER MUNICIPAL RAILWAY

SHEET 8 OF 117 | DRAWING NO. DL-9808 | REVISION NO. AB

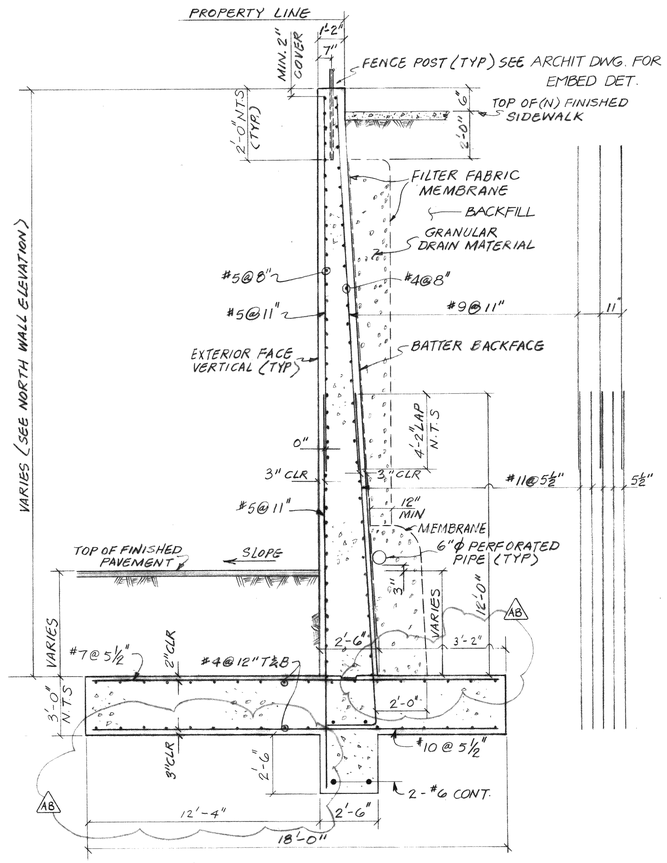
AS BUILT

ELEVATION DATUM

REVISIONS

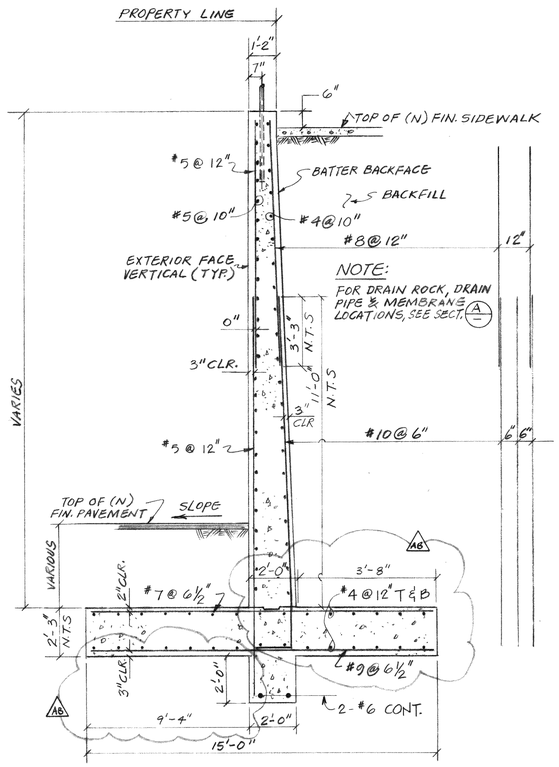
NO	DATE	DESCRIPTION	BY	APPR'D
A	6/24/94	AS BUILT	HL	
A	5-93	AS BUILT	JF	

REGISTERED PROFESSIONAL ENGINEER — RONALD KUN — CIVIL — CE 29024 — STATE OF CALIFORNIA



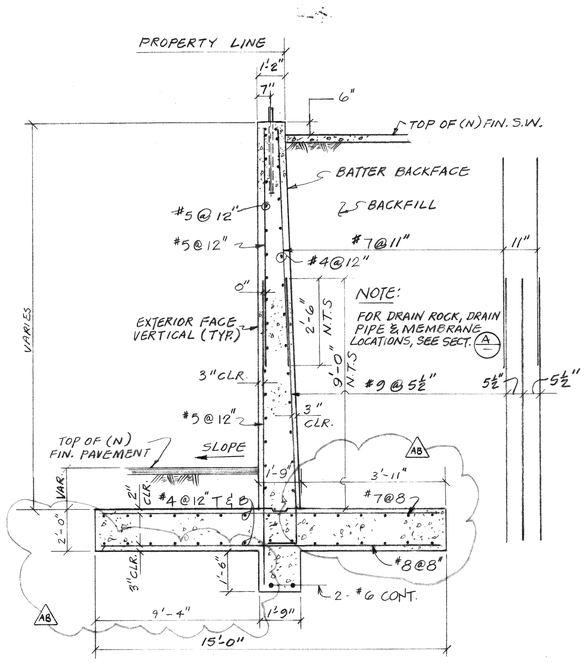
SECTION (A / C6)

(TYP. FOR WALL FROM E-281 TO E-365)



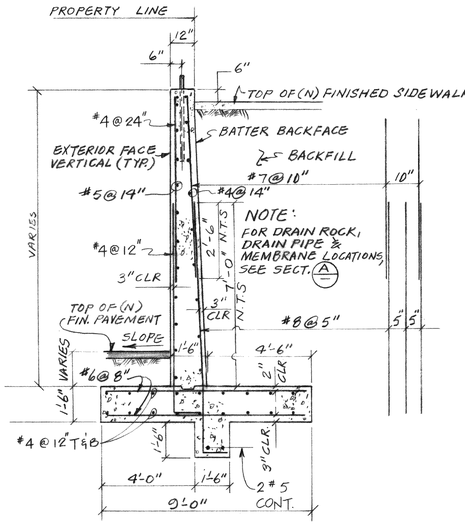
SECTION (B / C6)

(TYP. FOR WALL FROM E-191 TO E-281)



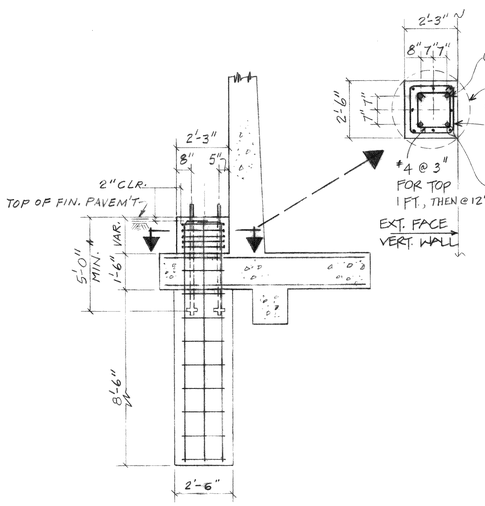
SECTION (C / C6)

(TYP. FOR WALL FROM E-106 TO E-191)



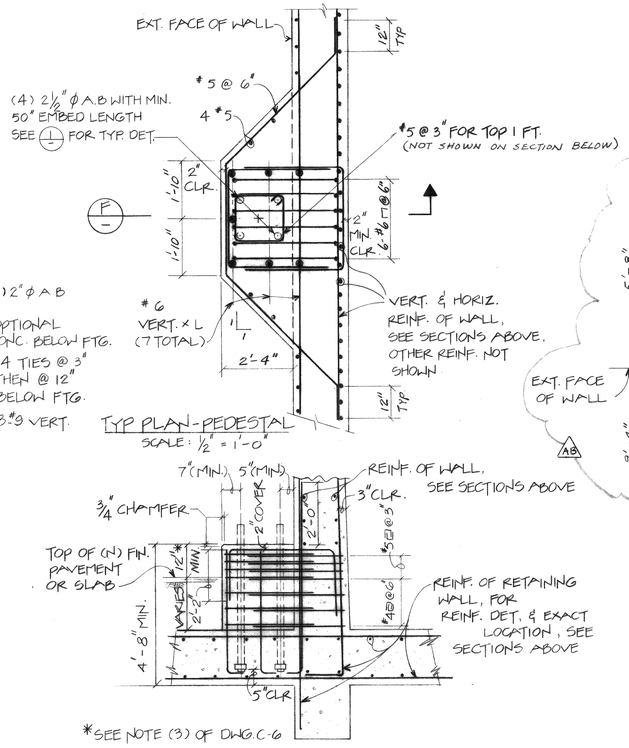
SECTION (D / C6)

(TYP. FOR WALL FROM N-403 TO N-491.8)



TYP. SECTION (E / C6)

SCALE: 3/8" = 1'-0"

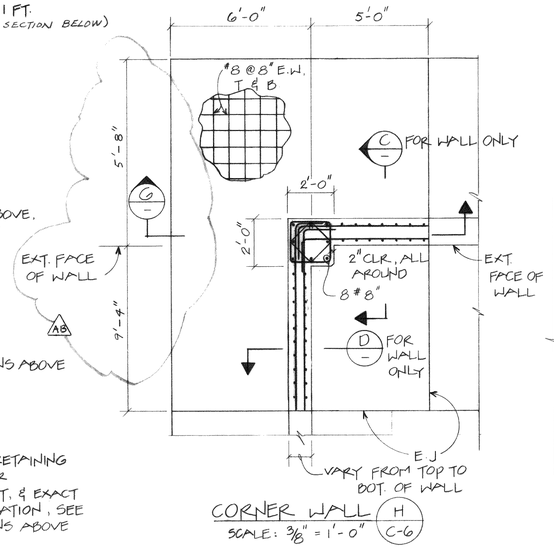


TYP PLAN-PEDESTAL

SCALE: ½" = 1'-0"

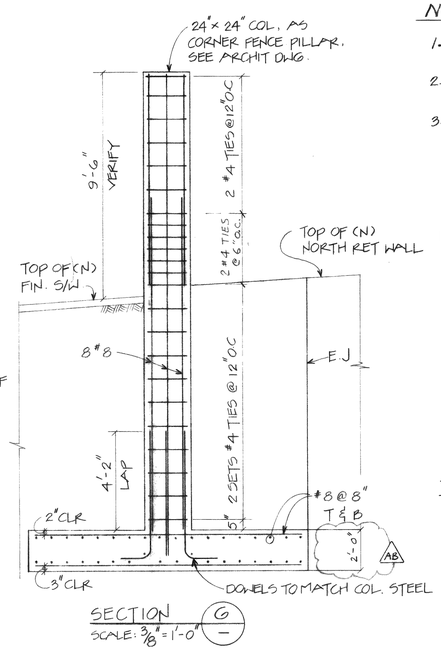
SECTION (F / C6)

SCALE: ½" = 1'-0"



CORNER WALL (H / C-6)

SCALE: 3/8" = 1'-0"

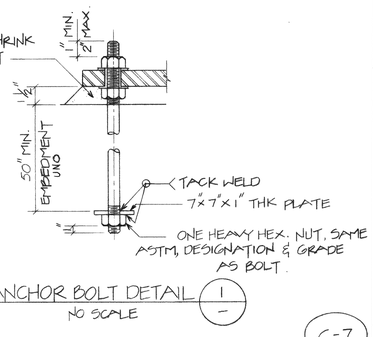


SECTION (G / -)

SCALE: 3/8" = 1'-0"

NOTE:

1. ¼" MASTIC JOINT BETWEEN PAVEMENT AND RETAINING WALL.
2. ANCHOR BOLTS AND NUTS SHALL CONFORM TO ASTM A307.
3. ANCHOR BOLTS SHALL NOT BE TIGHTENED UNTIL AT LEAST 14 DAYS HAVE ELAPSED AFTER PLACING OF CONCRETE.



TYP. ANCHOR BOLT DETAIL (1 / -)

NO SCALE

C-7

CONTRACT NO. MR-869

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
UTILITIES ENGINEERING BUREAU

MUNI-POTRERO DIV. REHABILITATION

RETAINING WALL SECTIONS & DETAILS

RECOMMENDED: [signature] MANAGER, UTILITIES ENGINEERING BUREAU

DESIGNED BY: JF | DR: G/N/L | SCALE: 3/8" U.O.N
CHECKED BY: RV | TR: | DATE: 11-1-89

APPROVED: [signature] GENERAL MANAGER, PUBLIC UTILITIES COMMISSION

APPROVED: Johnson & Stein, MUNICIPAL RAILWAY

DRAWING NO. DL-9809 | REVISION NO. AS

SHEET 9 OF 117

REGISTERED PROFESSIONAL ENGINEER, RICHARD KUN CHAN, CE 29024, STATE OF CALIFORNIA, EXP. 6-30-93

AS BUILT

ELEVATION DATUM

REVISIONS

NO.	DATE	DESCRIPTION	BY	APPR'D
AS	7/11/94	AS BUILT	HL	
AS	5-93	AS BUILT	J F	

10-16-89

JE 5/93

APPENDIX B

LOGS OF TEST BORINGS BY OTHERS

LOG OF TEST BORING 1

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 1/5/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT	
	16.3	109	0		55*	ASPHALTIC CONCRETE - 4" thick RED-BROWN CLAYEY GRAVEL (GC) dense, moist (fill) BROWN CLAYEY SAND (SC) dense, moist
			5			NO GROUNDWATER ENCOUNTERED DURING DRILLING
			10			
			15			

UC = UNCONFINED COMPRESSIVE SHEAR STRENGTH (psf)
PI = PLASTICITY INDEX (%)
LL = LIQUID LIMIT (%)

SAMPLER TYPES:
CALIFORNIA DRIVE
O.D.: 2.5 inches
I.D.: 2.0 inches

*MODIFIED CALIFORNIA DRIVE
O.D.: 3.0 inches
I.D.: 2.5 inches

HAMMER WEIGHT: 140 pounds
HAMMER DROP: 30 inches
(Test borings 1-8)

LOG OF TEST BORING 2

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 1/5/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT	
	15.9	109	0		51*	ASPHALTIC CONCRETE - 4" thick RED-BROWN CLAYEY SAND (SC) dense, moist, with gravel (fill) MOTTLED ORANGE AND BROWN CLAYEY SAND (SC) dense, moist
			5			NO GROUNDWATER ENCOUNTERED DURING DRILLING
			10			
			15			

Subsurface Consultants

MUNI-POTRERO - SAN FRANCISCO, CA

JOB NUMBER	DATE	APPROVED
473.002	1/20/89	

PLATE 2

LOG OF TEST BORING 3

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 1/5/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT	
			0			ASPHALTIC CONCRETE - 4" thick RED-BROWN CLAYEY GRAVEL (GC) dense, moist (fill)
	16.7	115	5		90*	ORANGE-BROWN CLAYEY SAND (SC) dense, moist NO GROUNDWATER ENCOUNTERED DURING DRILLING
			10			
			15			

LOG OF TEST BORING 4

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 1/5/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT	
			0			ASPHALTIC CONCRETE - 4" thick RED-BROWN CLAYEY GRAVEL (GC) dense, moist (fill)
	15.5	111	5		41*	MOTTLED ORANGE AND BROWN CLAYEY SAND (SC) medium dense, moist NO GROUNDWATER ENCOUNTERED DURING DRILLING
			10			
			15			

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MUNI-POTRERO - SAN FRANCISCO, CA

JOB NUMBER	DATE	APPROVED	PLATE
473.002	1/20/89		3

LOG OF TEST BORING 5

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 1/5/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT	
			0			ASPHALTIC CONCRETE - 4" thick
PI = 4%						BROWN SANDY CLAY (CL-ML)
LL = 19%	16.7	106			8*	soft, moist (fill)
UC = 140 psf	19.2	97			3*	
			5		3*	
						ORANGE-BROWN CLAYEY SAND (SC)
						medium dense, moist
			10			
	16.8	109			20*	
						becomes dense
	18.5	90	15		74*	
	20.1	104	20		39*	
						NO GROUNDWATER ENCOUNTERED DURING DRILLING
			25			
			30			
			35			
			40			

Subsurface Consultants

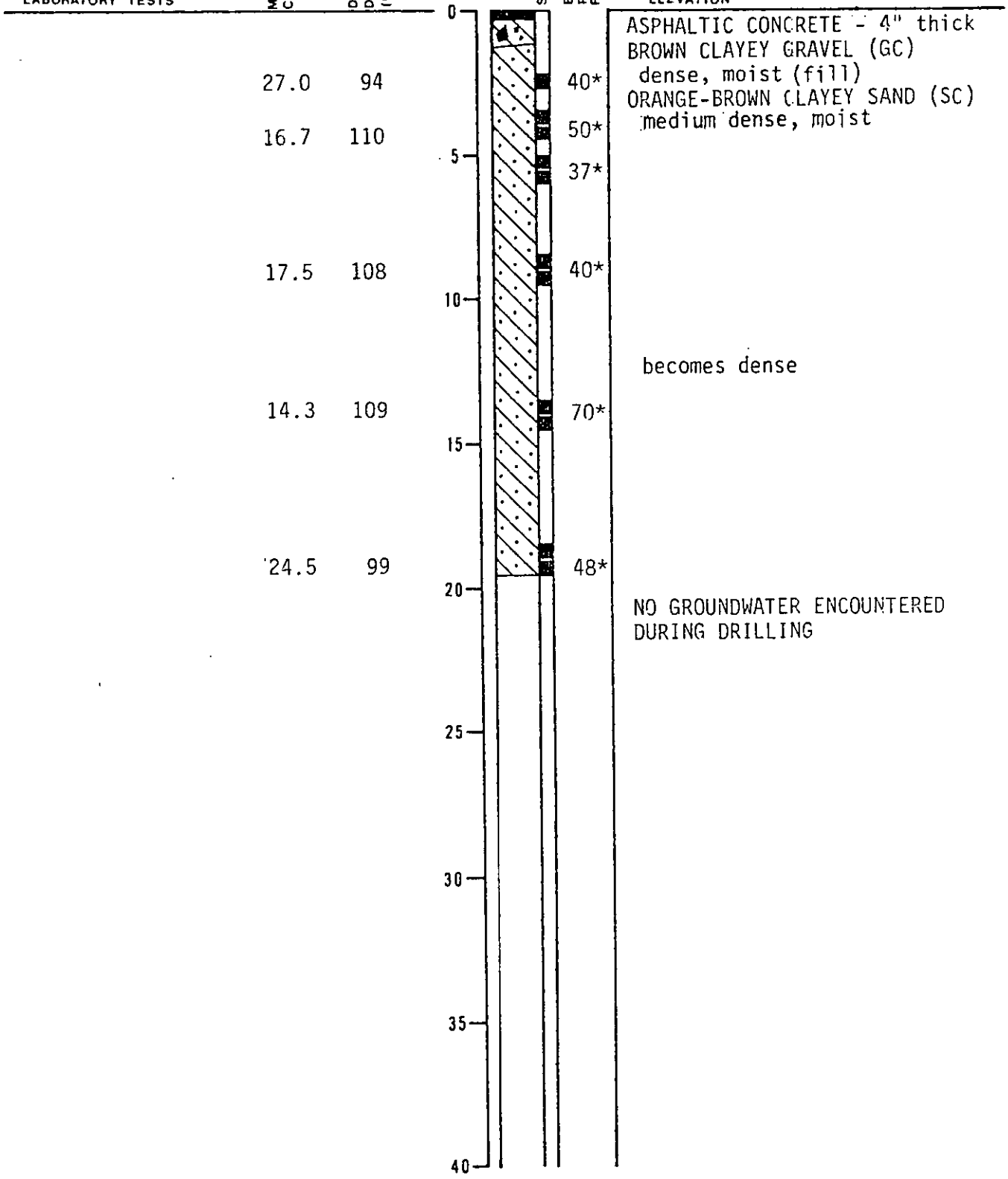
MUNI-POTRERO - SAN FRANCISCO, CA

JOB NUMBER	DATE	APPROVED
473.002	1/20/89	

PLATE 4

LOG OF TEST BORING 6

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 1/5/89
ELEVATION --



Subsurface Consultants

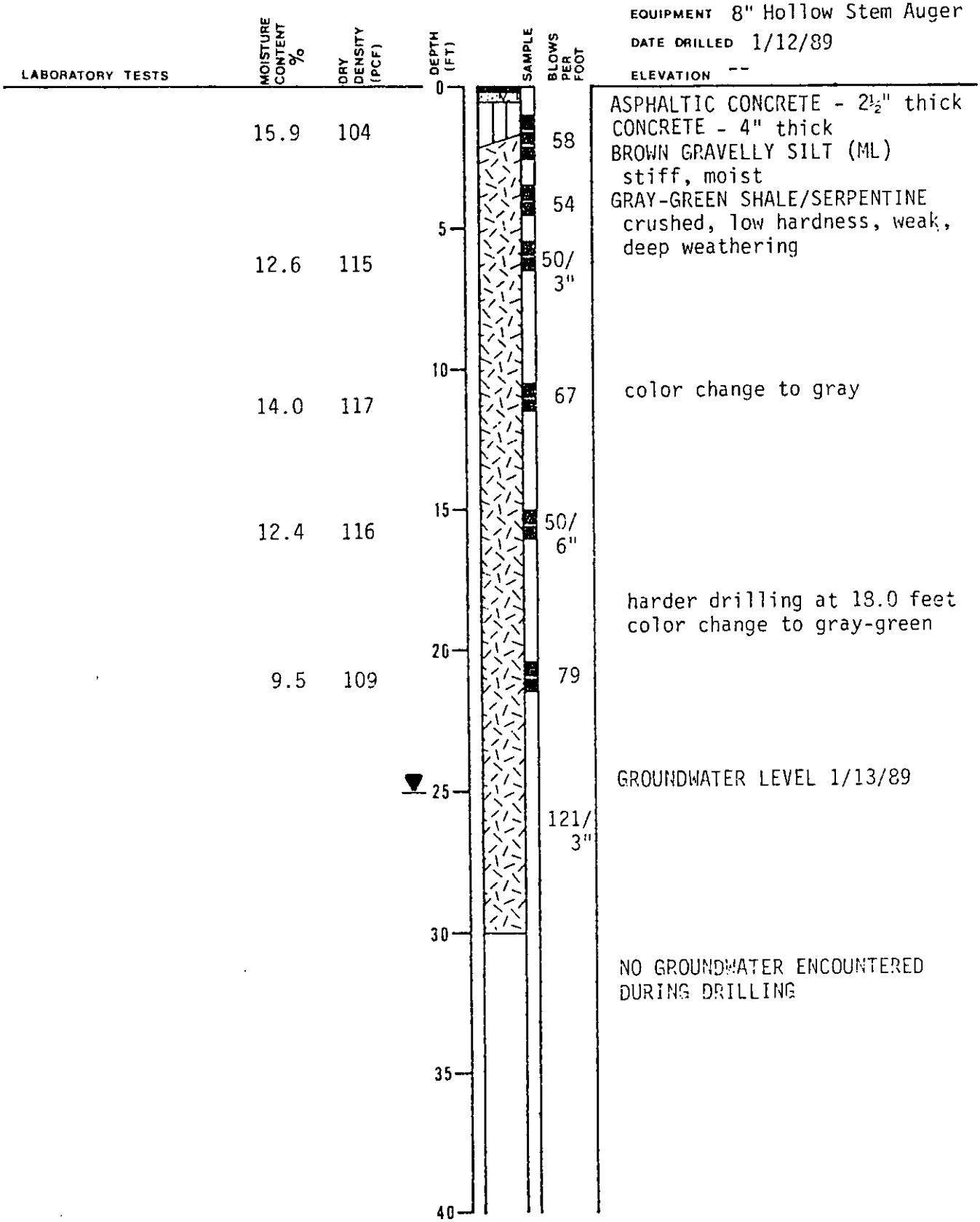
MUNI-POTRERO - SAN FRANCISCO, CA

JOB NUMBER	DATE	APPROVED
473.002	1/20/89	

PLATE 5

LOG OF TEST BORING 7

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 1/12/89
ELEVATION --



Subsurface Consultants

MUNI-POTRERO - SAN FRANCISCO, CA

JOB NUMBER	DATE	APPROVED
473.002	1/20/89	

PLATE 6

LOG OF TEST BORING 9

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 1/12/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT	
			0			CONCRETE - 12" thick
					17/ 4"	GREEN SHALE/SERPENTINE intensely fractured, low hardness, weak, deep weathering
	22.5	91			50/ 4"	
			5		50/ 6"	
	21.9	95			50/ 6"	
			10			NO GROUNDWATER ENCOUNTERED DURING DRILLING
			15			

HAMMER WEIGHT: 150 pounds
HAMMER DROP: 27 inches
(Test borings 9-11)

LOG OF TEST BORING 10

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 1/18/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT	
			0			ASPHALTIC CONCRETE - 3" thick
					7	RED-BROWN CLAYEY GRAVEL (GC) loose, moist (fill)
UC = 3100 psf	20.4	107			20	LIGHT BROWN CLAYEY SAND (SC) loose, moist
			5			ORANGE-GRAY SANDY CLAY (CL)
	14.7	106			48	stiff, moist
						ORANGE-BROWN CLAYEY SAND (SC) dense, moist
			10			
	27.2	87			34	
						NO GROUNDWATER ENCOUNTERED DURING DRILLING
			15			

Subsurface Consultants

MUNI-POTRERO - SAN FRANCISCO, CA

JOB NUMBER 473.002 | DATE 1/18/89 | APPROVED

PLATE 8

LOG OF TEST BORING 11

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 1/18/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT	
			0			ASPHALTIC CONCRETE - 3" thick
						DARK BROWN CLAYEY GRAVEL (GC) loose, moist(fill)
	20.0	107			21	LIGHT ORANGE-GRAY SANDY CLAY (CL) stiff, moist
	19.2	106			23	
			5		25	
						ORANGE-BROWN CLAYEY SAND (SC) dense, moist
	20.1	107	10		54	
						NO GROUNDWATER ENCOUNTERED DURING DRILLING
			15			
			20			
			25			
			30			
			35			
			40			

Subsurface Consultants

MUNI-POTRERO - SAN FRANCISCO, CA

JOB NUMBER	DATE	APPROVED
473.002	1/20/89	

PLATE 9

GENERAL SOIL CATEGORIES			SYMBOLS	TYPICAL SOIL TYPES
COARSE GRAINED SOILS More than half is larger than No. 200 sieve	GRAVEL More than half coarse fraction is larger than No. 4 sieve size	Clean Gravel with little or no fines	GW	Well Graded Gravel, Gravel-Sand Mixtures
			GP	Poorly Graded Gravel, Gravel-Sand Mixtures
		Gravel with more than 12% fines	GM	Silty Gravel, Poorly Graded Gravel-Sand-Silt Mixtures
			GC	Clayey Gravel, Poorly Graded Gravel-Sand-Clay Mixtures
	SAND More than half coarse fraction is smaller than No. 4 sieve size	Clean sand with little or no fines	SW	Well Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sand with more than 12% fines	SM	Silty Sand, Poorly Graded Sand-Silt Mixtures
			SC	Clayey Sand, Poorly Graded Sand-Clay Mixtures
FINE GRAINED SOILS More than half is smaller than No. 200 sieve	SILT AND CLAY Liquid Limit Less than 50%		ML	Inorganic Silt and Very Fine Sand, Rock Flour, Silty or Clayey Fine Sand, or Clayey Silt with Slight Plasticity
			CL	Inorganic Clay of Low to Medium Plasticity, Gravelly Clay, Sandy Clay, Silty Clay, Lean Clay
			OL	Organic Clay and Organic Silty Clay of Low Plasticity
	SILT AND CLAY Liquid Limit Greater than 50%		MH	Inorganic Silt, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silt
			CH	Inorganic Clay of High Plasticity, Fat Clay
			OH	Organic Clay of Medium to High Plasticity, Organic Silt
HIGHLY ORGANIC SOILS			PT	Peat and Other Highly Organic Soils

UNIFIED SOIL CLASSIFICATION SYSTEM

Subsurface Consultants

MUNI-POTRERO - SAN FRANCISCO, CA

JOB NUMBER	DATE	APPROVED
473.002	1/20/89	

PLATE 10

BEDDING OF SEDIMENTARY ROCKS

Very thick-bedded	Greater than 4.0	Bed thickness in feet
Thick-bedded	2.0 to 4.0	
Thin-bedded	0.2 to 2.0	
Very thin-bedded	0.05 to 0.2	
Laminated	0.01 to 0.05	
Thinly laminated	less than 0.01	

FRACTURING

Very little fractured	Greater than 4.0	Size of pieces in feet
Occasionally fractured	1.0 to 4.0	
Moderately fractured	0.5 to 1.0	
Closely fractured	0.1 to 0.5	
Intensely fractured	0.05 to 0.1	
Crushed	less than 0.05	

HARDNESS

Soft	reserved for plastic material alone.
Low hardness	can be gouged deeply or carved easily with a knife blade.
Moderately hard	can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away.
Hard	can be scratched with difficulty; scratch produces little powder and is often faintly visible.
Very hard	cannot be scratched with knife blade; leaves a metallic streak.

STRENGTH

Plastic	very low strength.
Friable	crumbles easily by rubbing with fingers.
Weak	an unfractured specimen of such material will crumble under light hammer blows.
Moderately strong	specimen will withstand a few heavy hammer blows before breaking.
Strong	specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.
Very strong	specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.

WEATHERING

Deep	moderate to complete mineral decomposition, extensive disintegration, deep and thorough discoloration, many fractures, all extensively coated or filled with oxides, carbonates and/or clay or silt.
Moderate	slight change or partial decomposition of minerals, little disintegration: cementation little to unaffected. Moderate to occasionally intense discoloration. Moderately coated fractures.
Little	no megascopic decomposition of minerals; little or no effect on normal cementation. Slight and intermittent, or localized discoloration. Few stains on fracture surfaces.
Fresh	unaffected by weathering agents. No disintegration or discoloration. Fractures usually less numerous than joints.

ROCK CLASSIFICATION CRITERIA

Subsurface Consultants

MUNI-POTRERO - SAN FRANCISCO, CA

JOB NUMBER	DATE	APPROVED
473.002	1/20/89	

PLATE 11

EQUIPMENT: **6" Flight Auger** ELEVATION: **

LOGGED BY: **A. Gruen** START DATE: **7-30-98**

FINISH DATE: **7-30-98**

Other Laboratory Tests	Pocket Penetrometer (ksf)	Moisture Content (%)	Dry Density (pcf)	% Passing #200 sieve	Blows/Foot	Sample	DEPTH (FEET)	
							0	1" AC Paving
							1	BROWN CLAYEY SAND (SC), medium dense to dense, moist to wet
							2	
					38		3	
		19.5		30			4	
					28		5	
		48.6		44			6	- rock fragments
							7	
							8	SERPENTINE, soft to moderately hard, plastic to weak, moderately weathered
							9	
							10	
					46		11	
		24.4		11			12	Drilling Refusal

BOTTOM OF BORING 1 @ 12 FEET
No Free Water Encountered

** Existing ground surface at time of drilling.

Earth Mechanics
Consulting Engineers

Job No: 98-1127
Appr:
Drwn: CD
Date: SEP 1998

LOG OF BORING 1

2440 Mariposa Street

San Francisco, California

PLATE **2**

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS More than Half > #200 sieve	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POOORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS More than Half < #200 sieve	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION SYSTEM

			Shear Strength, psf / Confining Pressure, psf	
Consol	Consolidation	Tx	2630 (240)	Unconsolidated Undrained Triaxial
LL	Liquid Limit (in %)	Tx sat	2100 (575)	Unconsolidated Undrained Triaxial, saturated prior to test
PL	Plastic Limit (in %)	DS	3740 (960)	Unconsolidated Undrained Direct Shear
PI	Plasticity Index	TV	1320	Torvane Shear
Gs	Specific Gravity	UC	4200	Unconfined Compression
SA	Sieve Analysis	LVS	500	Laboratory Vane Shear
■	Undisturbed Sample (2.5-inch ID)	FS	Free Swell	
◪	2-inch-ID Sample	EI	Expansion Index	
◧	Standard Penetration Test	Perm	Permeability	
☒	Bulk Sample	SE	Sand Equivalent	

KEY TO TEST DATA

Earth Mechanics
Consulting Engineers

Job No: 98-1127
Appr:
Drwn: CD
Date: SEP 1998

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA
2440 Mariposa Street
San Francisco, California

PLATE 3

PROJECT: **480 POTRERO AVENUE**
San Francisco, California

Log of Boring B-2

Boring location: See Site Plan, Figure 2 | Logged by: M. Pinheiro

Date started: 12/6/04 | Date finished: 12/6/04

Drilling method: Minute Man Rig; 4" Solid Auger

Hammer weight/drop: 140 lbs./30-inches | Hammer type:

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

LABORATORY TEST DATA

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					Ground Surface Elevation: 50.5 feet[2]						
					8.5-inches Concrete Slab						
1	S&H		10	CL	SANDY CLAY with GRAVEL (CL) yellow brown and brown, stiff, moist					16.0	105
2					FILL						
3	S&H		8	CL	SANDY CLAY (CL) dark brown, medium stiff to stiff, moist						
4											
5				CH	CLAY (CH) yellow brown, medium stiff to stiff, most						
6	S&H		30/4"		SERPENTINITE green brown, completely weathered, weak, soft, plastic						
7											
8	SPT		60/4"		deeply weathered						
9											
10											

Boring terminated at a depth of 8.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H blow counts converted to SPT N-Values using a factor of 0.6.
[2] Elevations based on San Francisco City datum.

Treadwell&Rollo

Project No.: 4048.01 | Figure: A-2

TEST GEOTECH LOG 404801.GPJ TR.GDT 12/21/04

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size)	**Gravels** (More than half of coarse fraction > no. 4 sieve size)	**GW**	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	**SW**	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine -Grained Soils (more than half of soil < no. 200 sieve size)	**Silts and Clays** LL = < 50	**ML**	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	**MH**	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		**PT**	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel	3" to No. 4	76.2 to 4.76
coarse	3" to 3/4"	76.2 to 19.1
fine	3/4" to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
coarse	No. 4 to No. 10	4.76 to 2.00
medium	No. 10 to No. 40	2.00 to 0.420
fine	No. 40 to No. 200	0.420 to 0.074
Silt and Clay	Below No. 200	Below 0.074

Unstabilized groundwater level

Stabilized groundwater level

SAMPLE DESIGNATIONS/SYMBOLS

Sample taken with Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter. Darkened area indicates soil recovered

Classification sample taken with Standard Penetration Test sampler

Undisturbed sample taken with thin-walled tube

Disturbed sample

Sampling attempted with no recovery

Core sample

Analytical laboratory sample

Sample taken with Direct Push sampler

SAMPLER TYPE

C Core barrel

CA California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter

D&M Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube

O Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube

PT Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube

S&H Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter

SPT Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter

ST Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

480 POTRERO AVENUE
San Francisco, California

CLASSIFICATION CHART

Treadwell&Rollo

Date 12/08/04 | Project No. 4048.01 | Figure A-3

I FRACTURING

Intensity	Size of Pieces in Feet
Very little fractured	Greater than 4.0
Occasionally fractured	1.0 to 4.0
Moderately fractured	0.5 to 1.0
Closely fractured	0.1 to 0.5
Intensely fractured	0.05 to 0.1
Crushed	Less than 0.05

II HARDNESS

1. **Soft** - reserved for plastic material alone.
2. **Low hardness** - can be gouged deeply or carved easily with a knife blade.
3. **Moderately hard** - can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away.
4. **Hard** - can be scratched with difficulty; scratch produced a little powder and is often faintly visible.
5. **Very hard** - cannot be scratched with knife blade; leaves a metallic streak.

III STRENGTH

1. **Plastic** or very low strength.
2. **Friable** - crumbles easily by rubbing with fingers.
3. **Weak** - an unfractured specimen of such material will crumble under light hammer blows.
4. **Moderately strong** - specimen will withstand a few heavy hammer blows before breaking.
5. **Strong** - specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.
6. **Very strong** - specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.

IV WEATHERING - The physical and chemical disintegration and decomposition of rocks and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation, and freezing and thawing.

D. Deep - moderate to complete mineral decomposition; extensive disintegration; deep and thorough discoloration; many fractures, all extensively coated or filled with oxides, carbonates and/or clay or silt.

M. Moderate - slight change or partial decomposition of minerals; little disintegration; cementation little to unaffected. Moderate to occasionally intense discoloration. Moderately coated fractures.

L. Little - no megascopic decomposition of minerals; little of no effect on normal cementation. Slight and intermittent, or localized discoloration. Few stains on fracture surfaces.

F. Fresh - unaffected by weathering agents. No disintegration of discoloration. Fractures usually less numerous than joints.

ADDITIONAL COMMENTS:

V CONSOLIDATION OF SEDIMENTARY ROCKS: usually determined from unweathered samples. Largely dependent on cementation.

U = unconsolidated
P = poorly consolidated
M = moderately consolidated
W = well consolidated

VI BEDDING OF SEDIMENTARY ROCKS

Splitting Property	Thickness	Stratification
Massive	Greater than 4.0 ft.	very thick-bedded
Blocky	2.0 to 4.0 ft.	thick bedded
Slabby	0.2 to 2.0 ft.	thin bedded
Flaggy	0.05 to 0.2 ft.	very thin-bedded
Shaly or platy	0.01 to 0.05 ft.	laminated
Papery	less than 0.01	thinly laminated

480 POTRERO AVENUE
San Francisco, California

Treadwell&Rollo

PHYSICAL PROPERTIES CRITERIA FOR ROCK DESCRIPTIONS

Date 12/14/04	Project No. 4048.01	Figure A-4

APPENDIX C

LOGS OF TEST BORINGS BY ARUP/RYCG

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-12-18; COMPLETION DATE: Mar-12-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106322.98418 / E6009541.52542 (NAD83)	HOLE ID: BH-01
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH, JT and WV	IN-SITU TESTING	SURFACE ELEVATION: 51.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-60.75')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time): 33 ft (3/12/2018)	TOTAL DEPTH OF BORING: 60.75 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	0		CONCRETE PAVEMENT (13") (CR).														
			SILTY SAND (SM); dark yellowish brown/dark reddish brown; fine; [FILL?].														
			SANDY CLAY interlayered with CLAYEY SAND (CL/SC); very stiff and medium dense; dark yellowish brown with black speckling; moist; fine SAND; [OLDER SEDIMENTARY DEPOSIT/COLMA FORMATION].		MC	S1	41	18	18	72.0			46	31			
46.80	5		CLAYEY SAND (SC); medium dense; dark yellowish brown; moist; fine.		MC	S2	44	18	15								
41.80	10		10.0', dense; decrease in CLAY content.		MC	S3	59	18	15	43.0	15	134	25	11	DS Phi´ = 40° c´ = 325 psf		
36.80	15		15.0', very dense.		SPT	S4	51	18	13								
31.80	20																

(continued)

ARUP/RYCG
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BOREHOLE NO. BH-01
SHEET 1 OF 4

1.0.2B-BOREHOLE LOG (SOIL)-ARUP/RYCG JV GINT_POTRERO.GPJ ARUP-RYCG GINT LIBRARY.GLB 9/30/19

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-12-18; COMPLETION DATE: Mar-12-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106322.98418 / E6009541.52542 (NAD83)	HOLE ID: BH-01
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH, JT and WV	IN-SITU TESTING	SURFACE ELEVATION: 51.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-60.75')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time): 33 ft (3/12/2018)	TOTAL DEPTH OF BORING: 60.75 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	20		POORLY GRADED SAND with CLAY (SP-SC); very dense; dark yellowish brown; moist; fine.		MC	S5	80/11"	17	14								
26.80	25		25.0', dense.		SPT	S6	46	18	15								
21.80	30		30.0', very moist.		MC	S7	59	18	15		26	120					Groundwater between 30' and 35', estimated at 33'.
			- hydrocarbon odor (like creosote) and dark oil droplets noticed in drilling mud at 33±.														
16.80	35		35.0', very dense; saturated; hydrocarbon odor in sample.		SPT	S8	54	18	18								
11.80	40																

(continued)

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PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-12-18; COMPLETION DATE: Mar-12-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106322.98418 / E6009541.52542 (NAD83)	HOLE ID: BH-01
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH, JT and WV	IN-SITU TESTING	SURFACE ELEVATION: 51.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-60.75')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time): 33 ft (3/12/2018)	TOTAL DEPTH OF BORING: 60.75 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	40		POORLY GRADED SAND (SP); very dense; dark yellowish brown; saturated; fine; slight hydrocarbon odor in sample.		MC	S9	83/11"	17	15								
6.80	45		45.0', slight hydrocarbon odor.		SPT	S10	74	18	18								
1.80	50		SERPENTINITE (SRP); soft with moderately hard zones (H6/H4); olive gray, olive and very dark gray.		MC	S11	50/3"	9	9								
-3.20	55		55.0', black; highly to completely weathered (W4/W5), very weak (R1), soft to moderately soft (H6/H5), with white mineralization.		SPT	S12	50/5"	11	8								
-8.20	60																

(continued)

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PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-12-18; COMPLETION DATE: Mar-12-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106322.98418 / E6009541.52542 (NAD83)	HOLE ID: BH-01
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH, JT and WV	IN-SITU TESTING	SURFACE ELEVATION: 51.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-60.75')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time): 33 ft (3/12/2018)	TOTAL DEPTH OF BORING: 60.75 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method	Casing Depth	Remarks/ Other Tests
	60				MC	S13	70/3"	9	9		21	127			UU 1.4			
			Borehole terminated at depth of 60.75 feet.															
			See Borehole Log Legend for soil classification chart and key to test data and sampler type.															
-13.20	65																	
-18.20	70																	
-23.20	75																	
-28.20	80																	

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BOREHOLE NO. BH-01
SHEET 4 OF 4

1.0.2B-BOREHOLE LOG (SOIL)-ARUP/RYCG JV GINT_POTRERO.GPJ ARUP-RYCG GINT LIBRARY.GLB 9/30/19

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-13-18; COMPLETION DATE: Mar-14-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106029.09884 / E6009623.035692 (NAD83)	HOLE ID: BH-02
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH and WV	IN-SITU TESTING: Suspension velocity	SURFACE ELEVATION: 49.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-121'), CORE(75'-82.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time)	TOTAL DEPTH OF BORING: 121 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	0		ASPHALT CONCRETE PAVEMENT, 2.5" (AC).														
			CONCRETE PAVEMENT, 6.5" (CR).														
			CLAYEY SAND (SC); medium dense; dark yellowish brown; moist; fine; very CLAYEY; [OLD SEDIMENTARY DEPOSIT/COLMA FORMATION].														
					MC	S1	26	18	18								
44.80	5																
			6.0', mottled with dark orange brown; decrease in CLAY content.		MC	S2	50	18	18	23.0	15	136	23	5			
39.80	10		POORLY GRADED SAND WITH CLAY (SP-SC); medium dense; dark yellowish brown mottled with dark orange brown; moist; fine; slight cementation.		MC	S3	42	18	16								
			CLAYEY SAND (SC); medium dense; dark yellowish mottled with dark orange brown; very moist to saturated; fine, very CLAYEY.														
34.80	15				MC	S4	25	18	13		19	133			UU 3.3		
			SANDY FAT CLAY (CH/CL); very stiff; yellowish brown mottled with dark orange brown; saturated; fine SAND.														
			CLAYEY SAND (SC); very dense; dark yellowish brown; very moist; fine.														
29.80	20																

(continued)

ARUP/RYCG
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BOREHOLE NO. BH-02
SHEET 1 OF 7

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-13-18; COMPLETION DATE: Mar-14-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106029.09884 / E6009623.035692 (NAD83)	HOLE ID: BH-02
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH and WV	IN-SITU TESTING: Suspension velocity	SURFACE ELEVATION: 49.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-121'), CORE(75'-82.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time)	TOTAL DEPTH OF BORING: 121 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	20				SPT	S5	51	18	17								
			POORLY GRADED SAND with SILT (SP-SM); dense; dark yellowish brown; moist; fine.														
24.80	25				MC	S6	58	18	14								
19.80	30		30.0', saturated.		SPT	S7	48	18	14								
14.80	35		35.0', no noticeable odors in sample.		MC	S8	58	18	14	11.0	23	125					
9.80	40																

(continued)

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-13-18; COMPLETION DATE: Mar-14-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106029.09884 / E6009623.035692 (NAD83)	HOLE ID: BH-02
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH and WV	IN-SITU TESTING: Suspension velocity	SURFACE ELEVATION: 49.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-121'), CORE(75'-82.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time)	TOTAL DEPTH OF BORING: 121 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	40				MC	S9	77	18	14								
										9.0	18	124			DS Phi´ = 37° c´ = 375 psf		
4.80	45																
			48.0', very dense.		SPT	S10	51	18	15								
-0.20	50																
-5.20	55																
			56.0', dense.		MC	S11	72	18	10								
											18	132					
-10.20	60																

(continued)

ARUP/RYCG
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BOREHOLE NO. BH-02
SHEET 3 OF 7

1.0.2B-BOREHOLE LOG (SOIL)-ARUP/RYCG JV GINT_POTRERO.GPJ ARUP-RYCG GINT LIBRARY.GLB 9/30/19

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-13-18; COMPLETION DATE: Mar-14-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106029.09884 / E6009623.035692 (NAD83)	HOLE ID: BH-02
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH and WV	IN-SITU TESTING: Suspension velocity	SURFACE ELEVATION: 49.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-121'), CORE(75'-82.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time)	TOTAL DEPTH OF BORING: 121 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	60																
			60.0', very dense.		SPT	S12	84/12"	18	13								
-15.20	65																
			SHALE (SH); dark gray, light greenish gray, and black; highly weathered (W4), extremely to very weak (R0/R1), soft (H6) with moderately soft zones (H5), with white mineralization, crystallizing (HCL-), moderately soft zones with thin laminations, highly sheared; [BEDROCK - FRANCISCAN MELANGE].		MC	S13	50/2"	8	8								
-20.20	70																
-25.20	75		75.0', dark gray and black; variably weak to moderately strong (R2/R3), moderately soft (H5), with very thin laminations, quartz inclusions, altered/sheared appearance.		MC	S14	50/6"	12	12		4						75.0' - 80.0', No recovery Soft drilling Switch to HQ3 rock coring
-30.20	80																

(continued)

ARUP/RYCG
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PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-13-18; COMPLETION DATE: Mar-14-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106029.09884 / E6009623.035692 (NAD83)	HOLE ID: BH-02
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH and WV	IN-SITU TESTING: Suspension velocity	SURFACE ELEVATION: 49.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-121'), CORE(75'-82.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS (Depth (Date/Time))	TOTAL DEPTH OF BORING: 121 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	80		SERPENTINITE MELANGE (SRP); black and dark gray; highly weathered (W4); very weak with weak zones and moderately strong clasts (R1/R2); soft to moderately soft (H6/H5); quartz inclusions; black zones with very thin friable foliation (altered shale?); dark gray moderately hard zones (SERPENTINITE); with clayey matrix (minor); saturated.														No recovery - gray clay in cuttings
					MC	S15	60	18	18								Switch to mud rotary with tricone bit. Drill out to 82.5' (too soft to core)
-35.20	85																
					MC	S16	72/6"	12	8								
-40.20	90																
-45.20	95		95.0', highly weathered with completely weathered clay zones.		MC	S17	90/10"	16	10								PP: 4.5 psf PP: >4.5 psf
-50.20	100																

(continued)

ARUP/RYCG
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BOREHOLE NO. BH-02
SHEET 5 OF 7

1.0.2B-BOREHOLE LOG (SOIL)-ARUP/RYCG JV GINT_POTRERO.GPJ ARUP-RYCG GINT LIBRARY.GLB 9/30/19

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-13-18; COMPLETION DATE: Mar-14-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106029.09884 / E6009623.035692 (NAD83)	HOLE ID: BH-02
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH and WV	IN-SITU TESTING: Suspension velocity	SURFACE ELEVATION: 49.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-121'), CORE(75'-82.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time)	TOTAL DEPTH OF BORING: 121 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	100		100.5', gray green; highly weathered (W4); very weak (R1); soft (H6); talc-like appearance (crumbles by hand pressure).		MC	S18	78/6"	12	11								
-55.20	105		105.0', dark gray; weak (R2); moderately soft (H5).		MC	S19	55/3"	9	9								
-60.20	110		110.0', dark gray and black; completely weathered (W5); extremely weak; very soft to soft (H7/H6); GRAVELLY CLAY with structure; some highly weathered, very weak zones.		MC	S20	70/6"	12	12								
-65.20	115		115.0', grayish green, dark grayish green, and dark gray; variably highly and completely weathered (W4/W5); extremely to very weak (R0/R1); soft (H6); variably saturated CLAY and moist talc-like (grayish green) highly weathered rock.		MC	S21	80/6"	12	12								
-70.20	120																

(continued)

ARUP/RYCG
A Joint Venture

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-13-18; COMPLETION DATE: Mar-14-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106029.09884 / E6009623.035692 (NAD83)	HOLE ID: BH-02
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH and WV	IN-SITU TESTING: Suspension velocity	SURFACE ELEVATION: 49.8 ft (SF-VD13)
DRILLING METHOD: GARBAGE BARREL(0'-3'), MUD ROTARY(3'-121'), CORE(75'-82.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4"), SPT(1.375")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time)	TOTAL DEPTH OF BORING: 121 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
120					MC	S22	73/6"	12	12								
			Borehole terminated at depth of 121 feet.														
			See Borehole Log Legend for soil classification chart and key to test data and sampler type.														
-75.20	125																
-80.20	130																
-85.20	135																
-90.20	140																

ARUP/RYCG
A Joint Venture

BOREHOLE NO. BH-02
SHEET 7 OF 7

1.0.2B-BOREHOLE LOG (SOIL)-ARUP/RYCG JV GINT_POTRERO.GPJ ARUP-RYCG GINT LIBRARY.GLB 9/30/19

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-16-18; COMPLETION DATE: Mar-16-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106262.92825 / E6009772.481354 (NAD83)	HOLE ID: BH-03
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH, JT and WV	IN-SITU TESTING	SURFACE ELEVATION: 53.2 ft (SF-VD13)
DRILLING METHOD: HOLLOW STEM AUGER(0'-16')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time)	TOTAL DEPTH OF BORING: 16 ft

Elevation (ft)	Depth (ft)	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	0	ASPHALT CONCRETE PAVEMENT (2.5") (AC).														
		CONCRETE (8") (CR).														
		SILTY GRAVEL (GM); gray brown; saturated; [FILL].														
		CLAYEY SAND (SC); medium dense; dark yellowish brown; moist; fine; [COLMA FORMATION].														
				B	S1		6	6								
48.20	5			MC	S2	32	18	18	25.0			27	8			
				MC	S3	50/6"	12	12		36	103			UU 0.85		
43.20	10	SERPENTINITE (SRP); olive brown and very dark gray; highly weathered (W4); weak to moderately strong (R2/R3); variably moderately soft to moderately hard (H5/H4); [BEDROCK].														
		14.0', highly to moderately weathered (W4/W3); moderately strong (R3); hard (H3); with moderately soft matrix (H5).		MC	S4	60/5"	5	4								
38.20	15															
		Borehole terminated at depth of 16 feet on auger refusal.														
		See Borehole Log Legend for soil classification chart and key to test data and sampler type.														
33.20	20															

ARUP/RYCG
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BOREHOLE NO. BH-03
SHEET 1 OF 1

1.0.2B-BOREHOLE LOG (SOIL)-ARUP/RYCG JV GINT_POTRERO.GPJ ARUP-RYCG GINT LIBRARY.GLB 9/30/19

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-15-18; COMPLETION DATE: Mar-15-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2105997.62975 / E6009865.763362 (NAD83)	HOLE ID: BH-04
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH	IN-SITU TESTING	SURFACE ELEVATION: 52.8 ft (SF-VD13)
DRILLING METHOD: HOLLOW STEM AUGER(0'-20.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS (Depth (Date/Time))	TOTAL DEPTH OF BORING: 20.5 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method / Casing Depth	Remarks/ Other Tests
	0		CONCRETE DRIVEWAY (7") (CR).														
			SILTY GRAVEL (GM); gray and gray brown; slightly moist; [FILL].														
			CLAYEY GRAVEL (GC); dark brown; moist; sub angular and angular; with gravel to 1.5".		B	S1		12	12								
47.80	5		SILTY SAND with GRAVEL (SM); loose; dark yellowish brown; very moist; angular; with serpentinite gravel to 2".		MC	S2	12	18	16	49.0			67	29			
			SANDY LEAN CLAY (CL); medium stiff to stiff; mottled dark yellowish brown, brown and dark brown; saturated; with brown SANDY SILT inclusions; [FILL - DERIVED FROM NATIVE SOILS/COLMA FORMATION].		MC	S3	6	18	15								
42.80	10		CLAYEY SAND (SC); loose; mottled dark yellowish brown; saturated; fine; iron oxide staining; [OLD SEDIMENTARY DEPOSIT/COLMA FORMATION].		MC	S4	8	18	18								
37.80	15		15.0', very clayey.							49.0	18	128	36	22	DS Phi´ = 29° c´ = 250 psf		
			19.0', medium dense.		MC	S5	21	18	18								
32.80	20																

(continued)

ARUP/RYCG
A Joint Venture

BOREHOLE NO. BH-04
SHEET 1 OF 2

1.0.2B-BOREHOLE LOG (SOIL)-ARUP/RYCG JV GINT_POTRERO.GPJ ARUP-RYCG GINT LIBRARY.GLB 9/30/19

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-15-18; COMPLETION DATE: Mar-15-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2105997.62975 / E6009865.763362 (NAD83)	HOLE ID: BH-04
DRILLING CONTRACTOR/DRILLER: Pitcher Drilling/WH	IN-SITU TESTING	SURFACE ELEVATION: 52.8 ft (SF-VD13)
DRILLING METHOD: HOLLOW STEM AUGER(0'-20.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time)	TOTAL DEPTH OF BORING: 20.5 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method	Casing Depth	Remarks/ Other Tests
	20			⧓						42.0	20	128			DS Phi´ = 29° c´ = 450 psf			
			Borehole terminated at depth of 20.5 feet.															
			See Borehole Log Legend for soil classification chart and key to test data and sampler type.															
27.80	25																	
22.80	30																	
17.80	35																	
12.80	40																	

ARUP/RYCG
A Joint Venture

BOREHOLE NO. BH-04
SHEET 2 OF 2

1.0.2B-BOREHOLE LOG (SOIL)-ARUP/RYCG JV GINT_POTRERO.GPJ ARUP-RYCG GINT LIBRARY.GLB 9/30/19

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-16-18; COMPLETION DATE: Mar-16-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106363.51629 / E6009975.414344 (NAD83)	HOLE ID: BH-05
DRILLING CONTRACTOR/DRILLER: Pitcher/FT,WV and JT	IN-SITU TESTING	SURFACE ELEVATION: 53.5 ft (SF-VD13)
DRILLING METHOD: HAND AUGER(0'-4.2')	DRILL RIG: Hand Auger	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE/HAMMER ID	HAMMER EFFICIENCY, ERi
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time)	TOTAL DEPTH OF BORING: 4.2 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method	Casing Depth	Remarks/ Other Tests
	0		CONCRETE SLAB (7") (CR).															
			POORLY GRADED SAND with SILT and GRAVEL (SP-SM); dark brown; predominantly fine, trace of medium to coarse; with subrounded GRAVEL to 3"; [FILL].		B	S1		12	12									
			POORLY GRADED SAND (SP); dark yellowish brown; fine; [FILL?/NATIVE?].		B	S2		12	12									
48.50	5		Borehole terminated at depth of 4.2 feet on refusal of hand-auger on strata inferred to be Weathered Rock.															
			See Borehole Log Legend for soil classification chart and key to test data and sampler type.															
43.50	10																	
38.50	15																	
33.50	20																	

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BOREHOLE NO. BH-05
SHEET 1 OF 1

1.0.2B-BOREHOLE LOG (SOIL)-ARUP/RYCG JV GINT_POTRERO.GPJ ARUP-RYCG GINT LIBRARY.GLB 9/30/19

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-16-18; COMPLETION DATE: Mar-16-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106007.33927 / E6010016.556221 (NAD83)	HOLE ID: BH-06
DRILLING CONTRACTOR/DRILLER: Pitcher/FT,WV and JT	IN-SITU TESTING	SURFACE ELEVATION: 53.9 ft (SF-VD13)
DRILLING METHOD: HOLLOW STEM AUGER(0'-20.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS (Depth (Date/Time))	TOTAL DEPTH OF BORING: 20.5 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method	Casing Depth	Remarks/ Other Tests
	0		ASPHALT CONCRETE PAVEMENT (4") (AC).															
			CONCRETE (9") (CR).															
			SILTY GRAVEL with SAND (GM); light gray brown and gray; slightly moist; angular GRAVEL to 1"; [FILL].															
			CLAYEY SAND (SC); dark brown; very moist; fine to coarse SAND; trace GRAVEL to 1/2".		B	S1		12	12									
48.90	5		SANDY LEAN CLAY (CL); stiff; dark yellowish brown mottled with brown; very moist to saturated; fine, trace medium; [NATIVE].		MC	S2	8	18	18	69.0	18	126	35	20				
			CLAYEY SAND with LEAN CLAY lenses (SC-CL); loose/stiff; dark gray brown; saturated; CLAY lens at 6.5'.															
43.90	10		9.0', loose; dark gray brown mottled with dark yellowish brown; saturated; fine. 10.5', SANDY CLAY lens.		MC	S3	11	18	15									Free water, sampler wet, perched water?
			POORLY GRADED SAND with CLAY (SP-SC); medium dense; olive brown; very moist (no free water); fine.															
38.90	15				MC	S4	32	18	15	22.0	20	126			DS Phi´ = 34° c´ = 400 psf			
			SERPENTINITE (SRP); dark greenish gray mottled with yellowish brown; completely weathered (W5); extremely weak (R0); very soft (H7); [BEDROCK].															
33.90	20				MC	S5	36	18	18									

(continued)

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BOREHOLE NO. BH-06
SHEET 1 OF 2

PROJECT NAME	PROJECT LOCATION	PROJECT NUMBER
SFMTA Potrero Facility Rebuild	**2500 Mariposa Street, San Francisco, California**	**260018**
LOGGED BY: R. Fisher; BEGIN DATE: Mar-16-18; COMPLETION DATE: Mar-16-18	BOREHOLE LOCATION (Lat/Long or North/East and Datum): N2106007.33927 / E6010016.556221 (NAD83)	HOLE ID: BH-06
DRILLING CONTRACTOR/DRILLER: Pitcher/FT,WV and JT	IN-SITU TESTING	SURFACE ELEVATION: 53.9 ft (SF-VD13)
DRILLING METHOD: HOLLOW STEM AUGER(0'-20.5')	DRILL RIG: Fraste MultidrillXL (Track)	BOREHOLE DIAMETER: 5.0 in
SAMPLER TYPE(S) AND SIZE(S) (ID): MC(2.4")	SPT HAMMER TYPE/HAMMER ID: Automatic, 140 lbs, 30-inch drop	HAMMER EFFICIENCY, ERi: 91%
BOREHOLE BACKFILL AND COMPLETION: Neat cement grout	GROUNDWATER READINGS Depth (Date/Time)	TOTAL DEPTH OF BORING: 20.5 ft

Elevation (ft)	Depth (ft)	Material Graphics	Description	Sample Location	Sampler Type	Sample Number	N-Value (bl/ft)	Penetration (in)	Recovery (in)	200 Wash (%)	Moisture Content (%)	Total Unit Wt. (pcf)	Liquid Limit (%)	Plasticity Index (%)	Shear Strength (ksf)	Drilling Method	Casing Depth	Remarks/ Other Tests
	20		20.0', weathered to a stiff, hard CLAY.	⧓							21	129			UU 2.5			
			Borehole terminated at depth of 20.5 feet.															
			See Borehole Log Legend for soil classification chart and key to test data and sampler type.															
28.90	25																	
23.90	30																	
18.90	35																	
13.90	40																	

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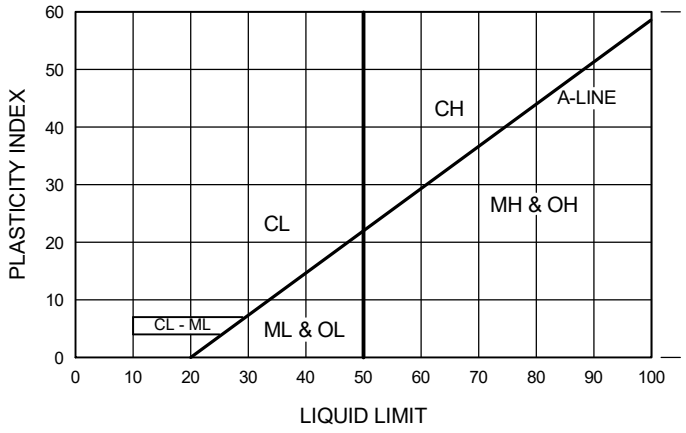
BOREHOLE NO. BH-06
SHEET 2 OF 2

1.0.2B-BOREHOLE LOG (SOIL)-ARUP/RYCG JV GINT_POTRERO.GPJ ARUP-RYCG GINT LIBRARY.GLB 9/30/19

INDEXED SOIL CLASSIFICATIONS

GRAPHIC	SYMBOL	DESCRIPTION	MAJOR DIVISIONS				
	GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	**CLEAN GRAVELS** (LITTLE OR NO FINES)	**GRAVELS** MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO.4 SIEVE SIZE	FOR VISUAL CLASSIFICATION, THE 1/4" SIZE MAY BE USED AS EQUIVALENT TO THE NO.4 SIEVE SIZE	**COARSE-GRAINED SOILS** MORE THAN HALF OF MATERIAL IS LARGER THAN NO.200 SIEVE SIZE	THE NO.200 U.S. STANDARD SIEVE IS ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE
	GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES					
	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	**GRAVELS WITH FINES** (APPRECIABLE AMOUNT OF FINES)				
	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES					
	SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES	**CLEAN SANDS** (LITTLE OR NO FINES)	**SANDS** MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO.4 SIEVE SIZE			
	SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES					
	SM	SILTY SANDS, SAND-SILT MIXTURES	**SANDS WITH FINES** (APPRECIABLE AMOUNT OF FINES)				
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES					
	ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	**SILTS & CLAYS** LIQUID LIMIT LESS THAN 50			**FINE-GRAINED SOILS** MORE THAN HALF OF MATERIAL IS SMALLER THAN NO.200 SIEVE SIZE	
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS					
	OL	ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY					
	MH	ORGANIC SILTS AND ORGANIC SILT-CLAYS OF HIGH PLASTICITY	**SILTS & CLAYS** LIQUID LIMIT GREATER THAN 50				
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS					
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS					
	PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	**HIGHLY ORGANIC SOILS**				
	OS	OILY SEDIMENTS					

PLASTICITY CHART



KEY TO TEST DATA

CONSOL = CONSOLIDATION
CORR = CORROSIVITY
DS = DIRECT SHEAR
ORG = ORGANIC CONTENT
PERM = PERMEABILITY
PP = POCKET PENETROMETER
RV = R-VALUE
TV = FIELD TORVANE
TXCD = CONSOLIDATED DRAINED TRIAXIAL
TXCU = CONSOLIDATED UNDRAINED TRIAXIAL
UCS = UNCONFINED COMPRESSIVE STRENGTH
UU = UNCONSOLIDATED UNDRAINED TRIAXIAL

KEY TO SAMPLER TYPE

HQ = HQ CORE BARREL SAMPLER
MC = MODIFIED CALIFORNIA SAMPLER
P = DAMES & MOORE PISTON SAMPLER
PS = PITCHER SAMPLER
SPT = STANDARD PENETRATION TEST SAMPLER
ST - SHELBY TUBE SAMPLER
NO RECOVERY

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SOIL CLASSIFICATION CHART AND KEY TO TEST DATA

APPENDIX D

GEOPHYSICAL SURVEY INVESTIGATION REPORT (GEOVISION GEOPHYSICAL SERVICES, INC.)

MTA POTRERO FACILITY

SUSPENSION VELOCITIES

BOREHOLE BH-POT-02

SAN FRANCISCO, CALIFORNIA

March 23, 2018
Report 18113-01 rev 0

MTA POTRERO FACILITY

SUSPENSION VELOCITIES

BOREHOLE BH-POT-02

SAN FRANCISCO, CALIFORNIA

Prepared for

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March 23, 2018
Report 18113-01 rev 0

TABLE OF CONTENTS

Table of Figures

Table of Tables

APPENDICES

INTRODUCTION

GEO*Vision* acquired PS Suspension data in one borehole at the Municipal Transportation Agency's Potrero Facility in San Francisco, California. This work was performed for Arup, Inc. Data analysis and report were reviewed by a **GEO***Vision* licensed California professional engineer or geophysicist.

SCOPE OF WORK

This report presents the results of PS Suspension velocity data collected on March 15th, 2018 as detailed in Table 1. The purpose of these measurements was to supplement stratigraphic information obtained during the drilling investigation.

The OYO Suspension PS Logging System (Suspension System) was used to obtain in-situ horizontal shear (S_H) and compressional (P) wave velocity measurements in one uncased borehole at 1.3 foot (0.4 m) intervals. Measurements followed **GEO***Vision* Procedure for PS Suspension Seismic Velocity Logging, revision 1.5. Acquired data were analyzed and a profile of velocity versus depth was produced for both S_H and P waves.

A detailed reference for the suspension PS velocity measurement techniques used in this study is:

> Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

INSTRUMENTATION

Suspension Velocity Instrumentation

Suspension velocity measurements were performed using the suspension PS logging system, manufactured by OYO Corporation, and their subsidiary, RG. This system directly determines the average velocity of a 3.3-foot high segment of the soil column surrounding the boring of interest by measuring the elapsed time between arrivals of a wave propagating upward through the soil column. The receivers that detect the wave, and the source that generates the wave, are moved as a unit in the boring producing relatively constant amplitude signals at all depths.

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave source (S_H) and compressional-wave source (P), joined to two biaxial receivers by a flexible isolation cylinder, as shown in Figure 1. The separation of the two receivers is 3.3 feet, allowing average wave velocity in the region between the receivers to be determined by inversion of the wave travel time between the two receivers. The total length of the probe as used in these surveys is approximately 22 feet, with the center point of the receiver pair 12.5 feet above the bottom end of the probe.

The probe receives control signals from, and sends the digitized receiver signals to, instrumentation on the surface via an armored multi-conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data using a sheave of known circumference fitted with a digital rotary encoder.

The entire probe is suspended in the boring by the cable, therefore, source motion is not coupled directly to the boring walls; rather, the source motion creates a horizontally propagating impulsive pressure wave in the fluid filling the boring and surrounding the source. This pressure wave is converted to P and S_H-waves in the surrounding soil and rock as it impinges upon the wall of the borehole. These waves propagate through the soil and rock surrounding the borehole, in turn causing a pressure wave to be generated in the fluid surrounding the receivers as the soil waves

pass their location. Separation of the P and S_H-waves at the receivers is performed using the following steps:

1. Orientation of the horizontal receivers is maintained parallel to the axis of the source, maximizing the amplitude of the recorded S_H -wave signals.
2. At each depth, S_H-wave signals are recorded with the source actuated in opposite directions, producing S_H-wave signals of opposite polarity, providing a characteristic S_H-wave signature distinct from the P-wave signal.
3. The 6.3 foot separation of source and receiver 1 permits the P-wave signal to pass and damp significantly before the slower S_H-wave signal arrives at the receiver.
4. In saturated soils, the received P-wave signal is typically of much higher frequency than the received S_H-wave signal, permitting additional separation of the two signals by low pass filtering.
5. Direct arrival of the original pressure pulse in the fluid is not detected at the receivers because the wavelength of the pressure pulse in fluid is significantly greater than the dimension of the fluid annulus surrounding the probe (feet versus inches scale), preventing significant energy transmission through the fluid medium.

In operation, a distinct, repeatable pattern of impulses is generated at each depth as follows:

1. The source is fired in one direction producing dominantly horizontal shear with some vertical compression, and the signals from the horizontal receivers situated parallel to the axis of motion of the source are recorded.
2. The source is fired again in the opposite direction and the horizontal receiver signals are recorded.
3. The source is fired again and the vertical receiver signals are recorded. The repeated source pattern facilitates the picking of the P and S_H-wave arrivals; reversal of the source changes the polarity of the S_H-wave pattern but not the P-wave pattern.

The data from each receiver during each source activation is recorded as a different channel on the recording system. The Suspension PS system has six channels (two simultaneous recording channels), each with a 1024 sample record. The recorded data are displayed as six channels with a common time scale. Data are stored on disk for further processing.

Review of the displayed data on the recorder or computer screen allows the operator to set the gains, filters, delay time, pulse length (energy), and sample rate to optimize the quality of the data before recording. Verification of the calibration of the Suspension PS digital recorder is performed every twelve months using a NIST traceable frequency source and counter, as presented in Appendix B.

MEASUREMENT PROCEDURES

Suspension Velocity

One borehole was logged uncased and filled with drilling fluid. Measurements followed the **GEO***Vision* Procedure for P-S Suspension Seismic Velocity Logging, revision 1.5. Prior to the logging run, the probe was positioned with the top of the probe even with a stationary reference point. The electronic depth counter was set to the distance between the mid-point of the receiver and the top of the probe, minus the height of the stationary reference point, if any, verified with a tape measure, and recorded on the field logs. The probe was lowered to the bottom of the borehole, stopping at 1.3 foot (400 mm) intervals to collect data, as summarized in Table 2.

At each measurement depth the measurement sequence of two opposite horizontal records and one vertical record was performed, and the gains were adjusted as required. The data from each depth were viewed on the computer display, checked, and saved before moving to the next depth.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring.

DATA ANALYSIS

Suspension Velocity

Using the proprietary OYO program PSLOG.EXE version 1.0, the recorded digital waveforms were analyzed to locate the most prominent first minima, first maxima, or first break on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between receiver 1 and receiver 2 (R1-R2) arrivals was used to calculate the P-wave velocity for that 1.0 meter segment of the soil column. When observable, P-wave arrivals on the horizontal axis records were used to verify the velocities determined from the vertical axis data. The time picks were then transferred into a Microsoft Excel® template to complete the velocity calculations based on the arrival time picks made in PSLOG.

The P-wave velocity over the 6.3-foot interval from source to receiver 1 (S-R1) was also picked using PSLOG, and calculated and plotted in Microsoft Excel®, for quality assurance of the velocity derived from the travel time between receivers. In this analysis, the depth values as recorded were increased by 4.8 feet to correspond to the mid-point of the 6.3-foot S-R1 interval. Travel times were obtained by picking the first break of the P-wave signal at receiver 1 and subtracting 0.35 milliseconds, the calculated and experimentally verified delay from source trigger pulse (beginning of record) to source impact. This delay corresponds to the duration of acceleration of the solenoid before impact.

As with the P-wave records, the recorded digital waveforms were analyzed to locate clear S_H-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the S_H-wave signals from the 'normal' and 'reverse' source pulses are very nearly inverted images of each other. Digital Fast Fourier Transform – Inverse Fast Fourier Transform (FFT – IFFT) lowpass filtering was used to remove the higher frequency P-wave signal from the S_H-wave signal. Different filter cutoffs were used to separate P- and S_H-waves at different depths, ranging from 600 Hz in the slowest zones to 4000 Hz in the regions of highest velocity. At each depth, the filter frequency was selected to be at least twice the fundamental frequency of the S_H-wave signal being filtered.

Generally, the first maxima were picked for the 'normal' signals and the first minima for the 'reverse' signals, although other points on the waveform were used if the first pulse was distorted. The absolute arrival time of the 'normal' and 'reverse' signals may vary by +/- 0.2 milliseconds, due to differences in the actuation time of the solenoid source caused by constant mechanical bias in the source or by boring inclination. This variation does not affect the R1-R2 velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

As with the P-wave data, S_H-wave velocity calculated from the travel time over the 6.3-foot interval from source to receiver 1 was calculated and plotted for verification of the velocity derived from the travel time between receivers. In this analysis, the depth values were increased by 4.8 feet to correspond to the mid-point of the 6.3-foot S-R1 interval. Travel times were obtained by picking the first break of the S_H-wave signal at the near receiver and subtracting 0.35 milliseconds, the calculated and experimentally verified delay from the beginning of the record at the source trigger pulse to source impact.

Poisson's Ratio, **ν**, was calculated in the Microsoft Excel® template using the following formula:

$$\nu = \frac{\left(\frac{V_s}{V_p}\right)^2 - 0.5}{\left(\frac{V_s}{V_p}\right)^2 - 1.0}$$

Data and analyses were reviewed by a **GEO***Vision* California professional geophysicist or engineer as a component of the in-house data validation program.

Figure 2 shows an example of R1 - R2 measurements on a sample filtered suspension record. In Figure 2, the time difference over the 3.3 foot interval of 1.88 milliseconds for the horizontal signals is equivalent to an S_H-wave velocity of 1745 feet/second. Whenever possible, time differences were determined from several phase points on the S_H-waveform records to verify the data obtained from the first arrival of the S_H-wave pulse. Figure 3 displays the same record before filtering of the S_H-waveform record with a 1400 Hz FFT - IFFT digital lowpass filter, illustrating the presence of higher frequency P-wave energy at the beginning of the record, and distortion of the lower frequency S_H-wave by residual P-wave signal.

RESULTS

Suspension Velocity

Suspension R1-R2 P- and S_H-wave velocities for borehole BH-POT-02 are presented in Figure 4. The suspension velocity data presented in this figure are also presented in Table 3. The Microsoft Excel® analysis file is also provided in the data directory that accompanies this report.

P- and S_H-wave velocity data from R1-R2 analysis and quality assurance analysis of S-R1 data are plotted together in Figure A-1 to aid in visual comparison. It should be noted that R1-R2 data are an average velocity over a 3.3-foot segment of the soil column; S-R1 data are an average over 6.3 feet, creating a significant smoothing relative to the R1-R2 plots. The S-R1 velocity data displayed in these figures are also presented in Table A-1 and are included in the Microsoft Excel® analysis file. The Microsoft Excel® analysis file also includes Poisson's Ratio calculations, tabulated data and plots.

SUMMARY

Discussion of Suspension Velocity Results

Suspension PS velocity data are ideally collected in an uncased, fluid filled boring drilled with rotary mud (rotary wash) methods, as was the case for this project.

Suspension PS velocity data quality is judged based upon 5 criteria.

	Criteria	BH-POT-02
1	Consistent data between receiver to receiver (R1 – R2) and source to receiver (S – R1) data.	Yes.
2	Consistency between data from adjacent depth intervals.	Yes
3	Consistent relationship between P-wave and SH -wave (excluding transition to saturated soils)	Yes Saturation occurs about 45 ft and top of rock is about 66 ft.
4	Clarity of P-wave and SH-wave onset, as well as damping of later oscillations.	This is very good data.
5	Consistency of profile between adjacent borings, if available.	Not Applicable

Quality Assurance

These borehole geophysical measurements were performed using industry-standard or better methods for measurements and analyses. All work was performed under **GEO***Vision* quality assurance procedures, which include:

- Use of NIST-traceable calibrations, where applicable, for field and laboratory instrumentation
- Use of standard field data logs
- Independent review of calculations and results by a registered professional engineer, geologist, or geophysicist

Suspension Velocity Data Reliability

P- and S_H-wave velocity measurement using the Suspension Method gives average velocities over a 3.3-foot interval of depth. This high resolution results in the scatter of values shown in the graphs. Individual measurements are very reliable with estimated precision of +/- 5%. Depth indications are very reliable with estimated precision of +/- 0.2 feet. Standardized field procedures and quality assurance checks contribute to the reliability of these data.

CERTIFICATION

All geophysical data, analysis, interpretations, conclusions, and recommendations in this document have been prepared under the supervision and review of a **GEO***Vision* California professional geophysicist or engineer.

Prepared by:

3/23/2018

Emily Feldman — Date
Senior Staff Geophysicist
GEO*Vision* Geophysical Services

Reviewed and approved by

3/23/2018

Victor Gonzalez — Date
California Professional Geophysicist, PGp. 1074
GEO*Vision* Geophysical Services

* This geophysical investigation was conducted under the supervision of a California Professional Geophysicist or Engineer using industry standard methods and equipment. A high degree of professionalism was maintained during all aspects of the project from the field investigation and data acquisition, through data processing, interpretation and reporting. All original field data files, field notes and observations, and other pertinent information are maintained in the project files and are available for the client to review for a period of at least one year.

  A professional geophysicist's certification of interpreted geophysical conditions comprises a declaration of his/her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations or ordinances.

Table 1. Boring locations and logging dates

BORING DESIGNATION	DATES LOGGED	LOCATION[1]		ELEVATION (FEET)
		LATITUDE	LONGITUDE	
BH-POT-02	3/15/2018			

[1] Coordinates not available at time of report

Table 2. Logging dates and depth ranges

BORING NUMBER	TOOL AND RUN NUMBER	DEPTH RANGE (FEET)	CASED OR UNCASED	SAMPLE INTERVAL (FEET)	DATE LOGGED
BH-POT-02	SUSPENSION DOWN01	3.94 – 107.61	UNCASED	1.31	3/15/2018

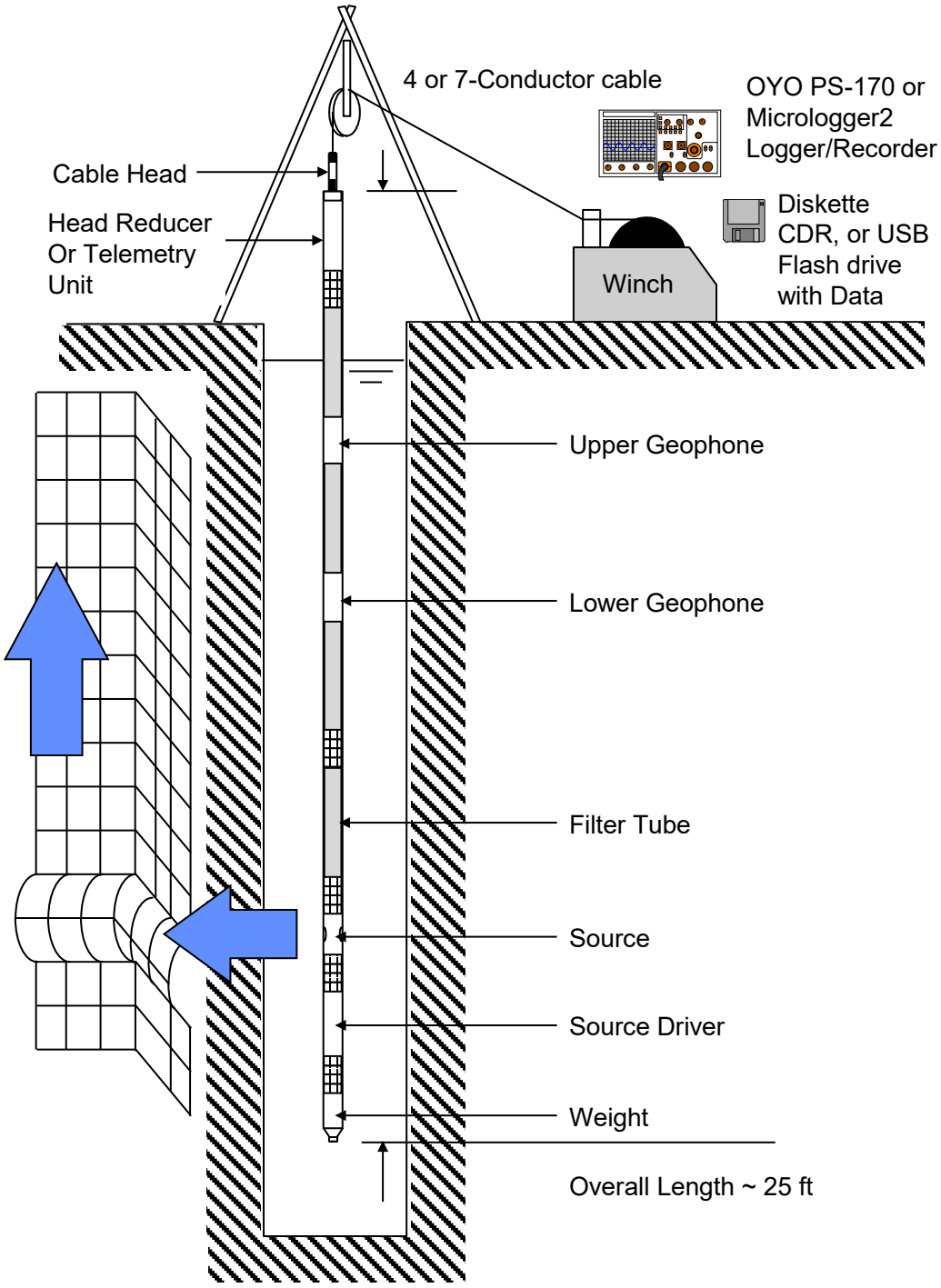

Figure 1: Concept illustration of P-S logging system

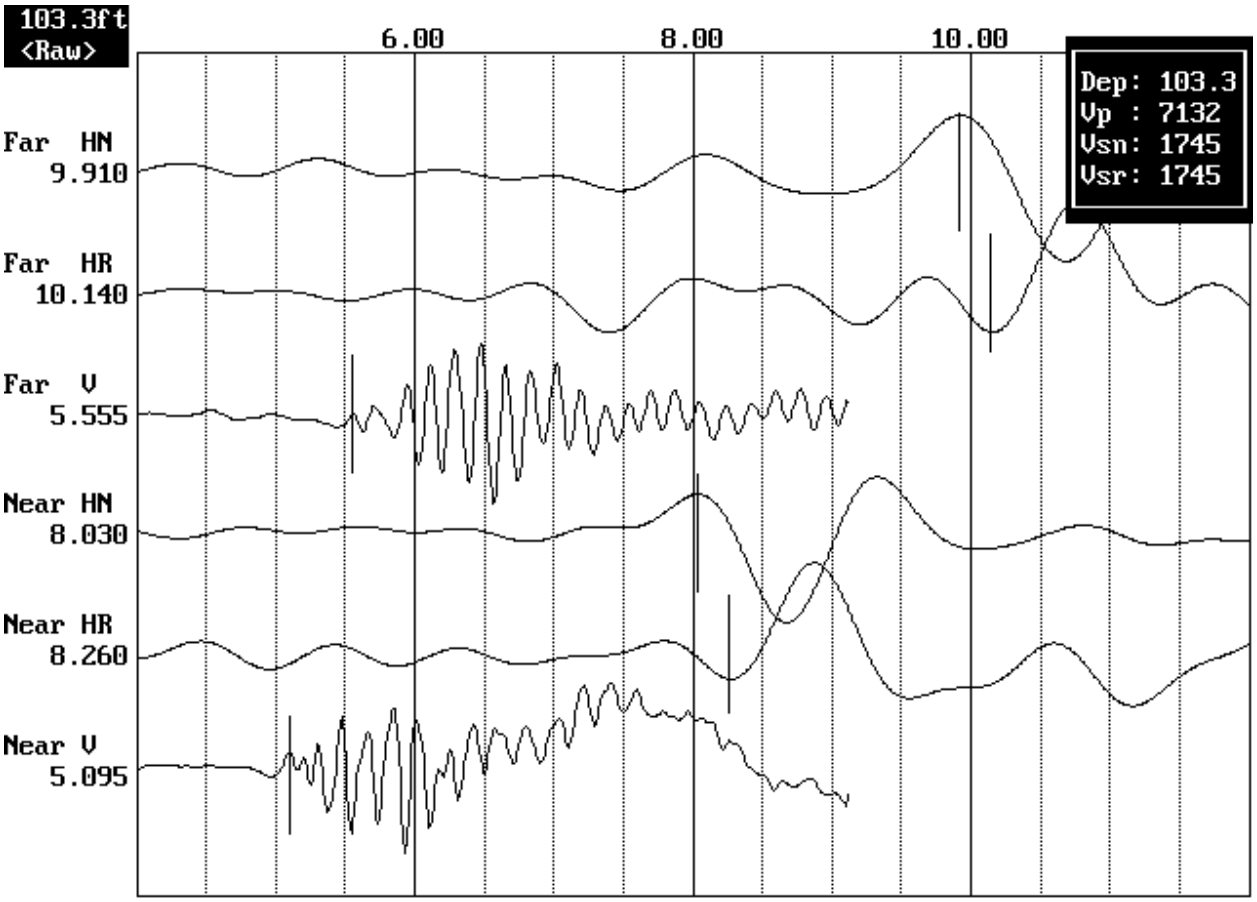

Figure 2: Example of filtered (1400 Hz lowpass) suspension record

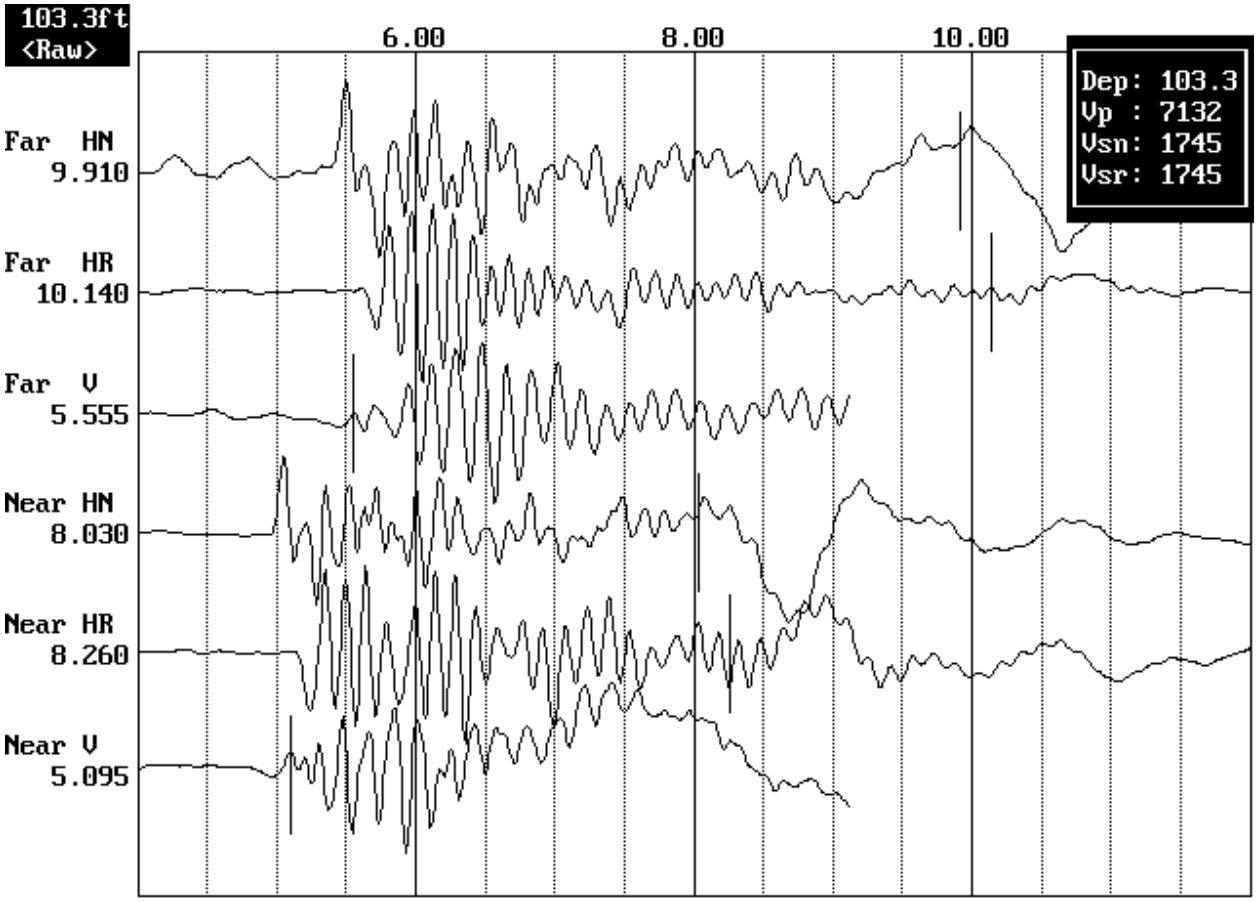

Figure 3. Example of unfiltered suspension record

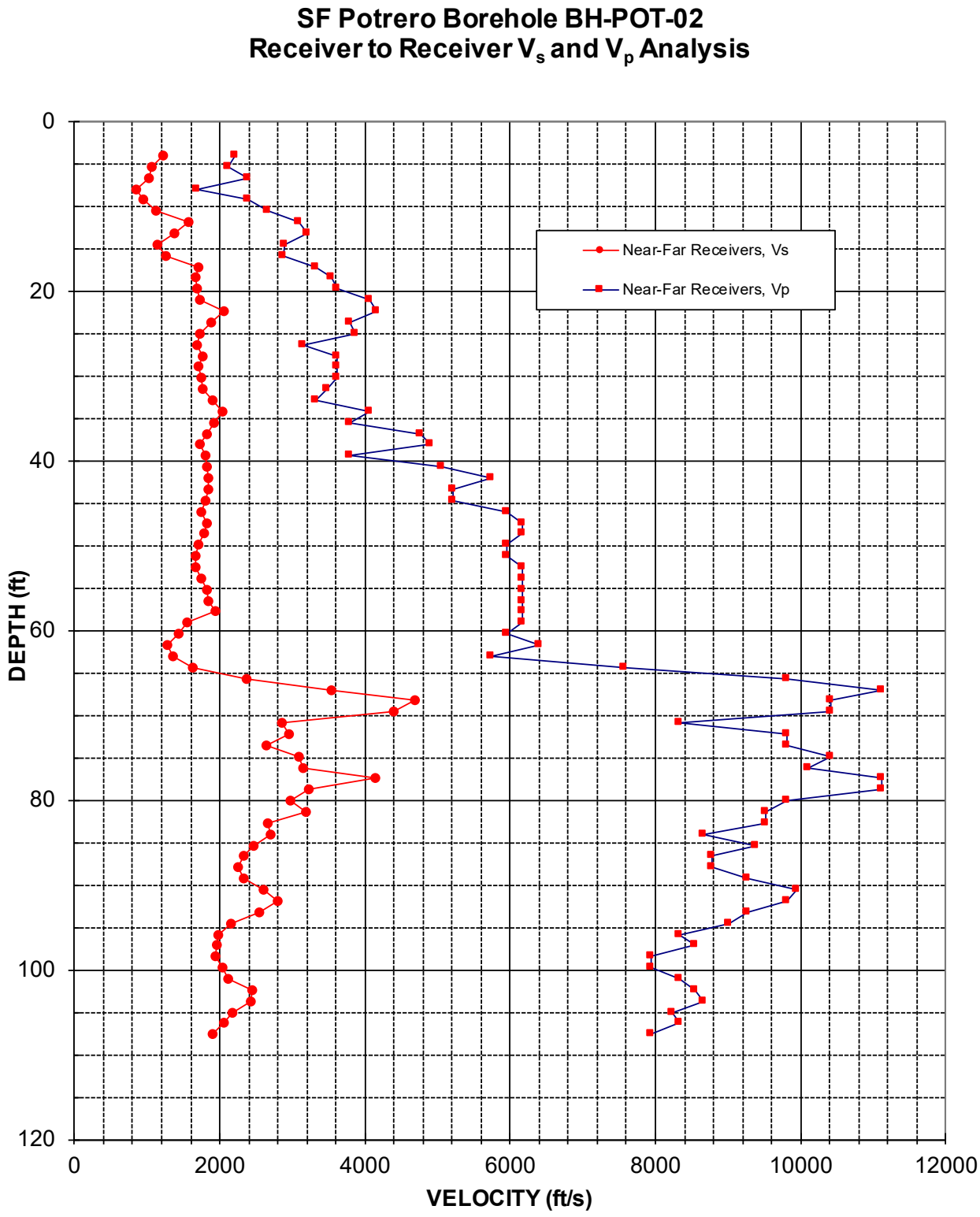

Figure 4: Boring BH-POT-02, Suspension R1-R2 P- and S_H-wave velocities

Table 3. Boring BH-POT-02, Suspension R1-R2 depths and P- and S_H-wave velocities

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio Based on Receiver-to-Receiver Travel Time Data - Borehole BH-POT-02

American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
3.9	1210	2220	0.29	1.2	370	680	0.29
5.3	1070	2110	0.33	1.6	330	640	0.33
6.6	1030	2380	0.39	2.0	310	730	0.39
7.9	850	1680	0.33	2.4	260	510	0.33
9.2	940	2380	0.41	2.8	290	730	0.41
10.5	1130	2670	0.39	3.2	340	810	0.39
11.8	1570	3090	0.33	3.6	480	940	0.33
13.1	1370	3210	0.39	4.0	420	980	0.39
14.4	1140	2900	0.41	4.4	350	880	0.41
15.8	1260	2870	0.38	4.8	380	880	0.38
17.1	1710	3330	0.32	5.2	520	1020	0.32
18.4	1670	3550	0.36	5.6	510	1080	0.36
19.7	1690	3620	0.36	6.0	520	1100	0.36
21.0	1720	4070	0.39	6.4	520	1240	0.39
22.3	2060	4170	0.34	6.8	630	1270	0.34
23.6	1870	3790	0.34	7.2	570	1150	0.34
24.9	1720	3880	0.38	7.6	520	1180	0.38
26.3	1680	3140	0.30	8.0	510	960	0.30
27.6	1770	3620	0.34	8.4	540	1100	0.34
28.9	1700	3620	0.36	8.8	520	1100	0.36
30.2	1740	3620	0.35	9.2	530	1100	0.35
31.5	1770	3470	0.32	9.6	540	1060	0.32
32.8	1900	3330	0.26	10.0	580	1020	0.26
34.1	2040	4070	0.33	10.4	620	1240	0.33
35.4	1920	3790	0.33	10.8	580	1150	0.33
36.8	1830	4760	0.41	11.2	560	1450	0.41
38.1	1720	4900	0.43	11.6	520	1490	0.43
39.4	1810	3790	0.35	12.0	550	1150	0.35
40.7	1820	5050	0.43	12.4	560	1540	0.43
42.0	1850	5750	0.44	12.8	560	1750	0.44
43.3	1840	5210	0.43	13.2	560	1590	0.43
44.6	1800	5210	0.43	13.6	550	1590	0.43
45.9	1740	5950	0.45	14.0	530	1810	0.45
47.2	1830	6170	0.45	14.4	560	1880	0.45
48.6	1780	6170	0.45	14.8	540	1880	0.45
49.9	1710	5950	0.46	15.2	520	1810	0.46
51.2	1680	5950	0.46	15.6	510	1810	0.46

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole BH-POT-02

American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p			V_s	V_p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
52.5	1680	6170	0.46	16.0	510	1880	0.46
53.8	1750	6170	0.46	16.4	530	1880	0.46
55.1	1830	6170	0.45	16.8	560	1880	0.45
56.4	1850	6170	0.45	17.2	560	1880	0.45
57.7	1950	6170	0.44	17.6	590	1880	0.44
59.1	1540	6170	0.47	18.0	470	1880	0.47
60.4	1440	5950	0.47	18.4	440	1810	0.47
61.7	1270	6410	0.48	18.8	390	1950	0.48
63.0	1350	5750	0.47	19.2	410	1750	0.47
64.3	1630	7580	0.48	19.6	500	2310	0.48
65.6	2360	9800	0.47	20.0	720	2990	0.47
66.9	3550	11110	0.44	20.4	1080	3390	0.44
68.2	4690	10420	0.37	20.8	1430	3180	0.37
69.6	4390	10420	0.39	21.2	1340	3180	0.39
70.9	2850	8330	0.43	21.6	870	2540	0.43
72.2	2950	9800	0.45	22.0	900	2990	0.45
73.5	2650	9800	0.46	22.4	810	2990	0.46
74.8	3090	10420	0.45	22.8	940	3180	0.45
76.1	3140	10100	0.45	23.2	960	3080	0.45
77.4	4140	11110	0.42	23.6	1260	3390	0.42
78.7	3220	11110	0.45	24.0	980	3390	0.45
80.1	2980	9800	0.45	24.4	910	2990	0.45
81.4	3190	9520	0.44	24.8	970	2900	0.44
82.7	2670	9520	0.46	25.2	810	2900	0.46
84.0	2700	8660	0.45	25.6	820	2640	0.45
85.3	2470	9390	0.46	26.0	750	2860	0.46
86.6	2320	8770	0.46	26.4	710	2670	0.46
87.9	2250	8770	0.46	26.8	690	2670	0.46
89.2	2330	9260	0.47	27.2	710	2820	0.47
90.6	2600	9950	0.46	27.6	790	3030	0.46
91.9	2800	9800	0.46	28.0	850	2990	0.46
93.2	2540	9260	0.46	28.4	780	2820	0.46
94.5	2160	9010	0.47	28.8	660	2750	0.47
95.8	1980	8330	0.47	29.2	600	2540	0.47
97.1	1970	8550	0.47	29.6	600	2610	0.47
98.4	1950	7940	0.47	30.0	590	2420	0.47
99.7	2040	7940	0.46	30.4	620	2420	0.46
101.1	2120	8330	0.47	30.8	650	2540	0.47
102.4	2450	8550	0.46	31.2	750	2610	0.46
103.7	2430	8660	0.46	31.6	740	2640	0.46

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole BH-POT-02

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p	
(ft)	(ft/s)	(ft/s)	
105.0	2160	8230	0.46
106.3	2060	8330	0.47
107.6	1900	7940	0.47

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V_s	V_p	
(m)	(m/s)	(m/s)	
32.0	660	2510	0.46
32.4	630	2540	0.47
32.8	580	2420	0.47

APPENDIX A

SUSPENSION VELOCITY MEASUREMENT QUALITY ASSURANCE SUSPENSION SOURCE TO RECEIVER ANALYSIS RESULTS

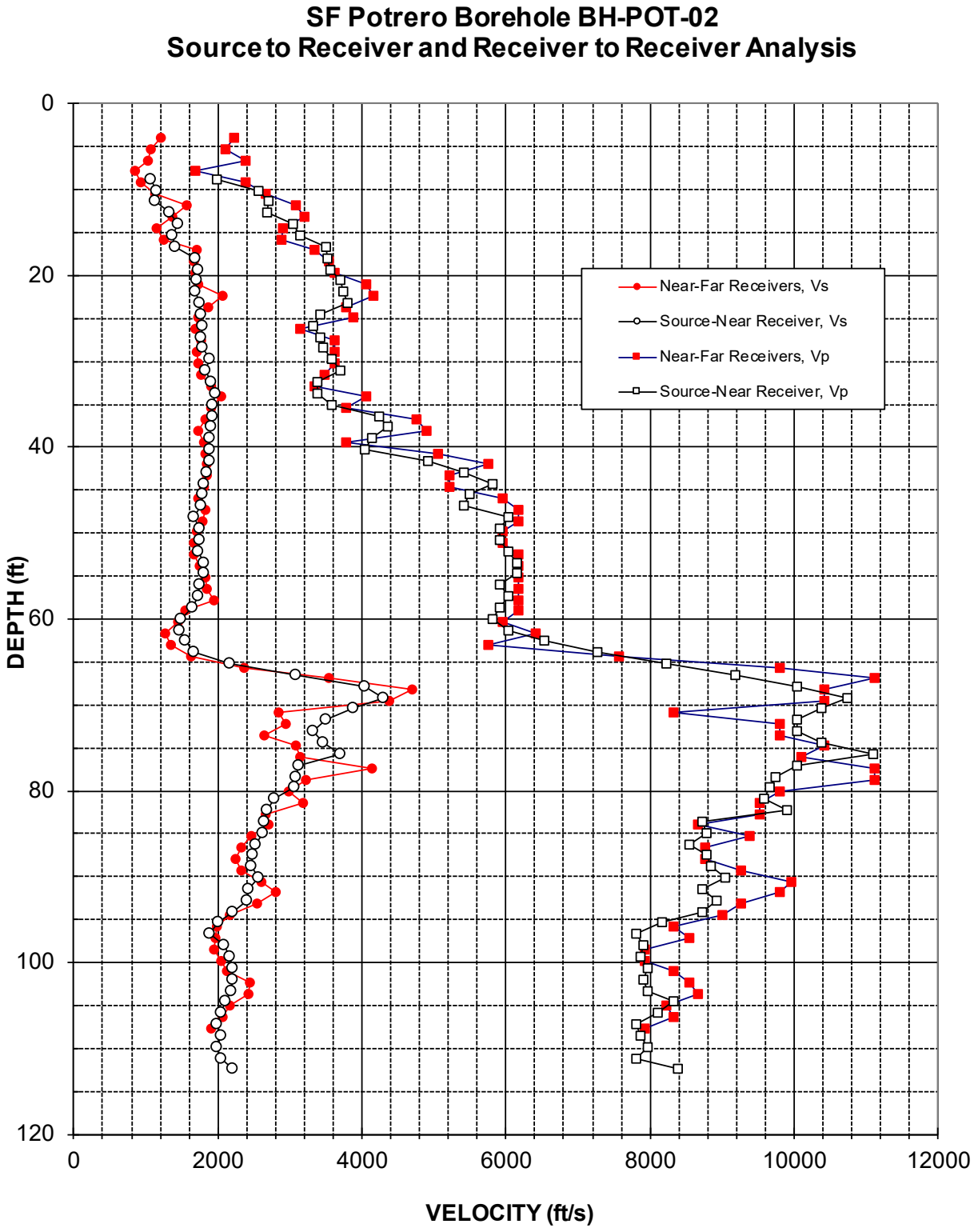

Figure A-1: Boring BH-POT-02, Suspension S-R1 P- and S_H-wave velocities

Table A-1. Boring BH-POT-02, S - R1 quality assurance analysis P- and S_H-wave data

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole BH-POT-02

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity V_s	Velocity V_p	Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity V_s	Velocity V_p	Poisson's Ratio
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
8.8	1070	1980	0.30	2.7	330	600	0.30
10.1	1160	2560	0.37	3.1	350	780	0.37
11.4	1140	2710	0.39	3.5	350	820	0.39
12.7	1330	2690	0.34	3.9	400	820	0.34
14.0	1450	3040	0.35	4.3	440	930	0.35
15.3	1370	3130	0.38	4.7	420	960	0.38
16.6	1400	3500	0.40	5.1	430	1070	0.40
18.0	1680	3520	0.35	5.5	510	1070	0.35
19.3	1720	3560	0.35	5.9	530	1080	0.35
20.6	1700	3700	0.37	6.3	520	1130	0.37
21.9	1680	3750	0.37	6.7	510	1140	0.37
23.2	1750	3790	0.36	7.1	530	1160	0.36
24.5	1770	3420	0.32	7.5	540	1040	0.32
25.8	1780	3310	0.30	7.9	540	1010	0.30
27.1	1760	3420	0.32	8.3	540	1040	0.32
28.5	1780	3460	0.32	8.7	540	1050	0.32
29.8	1900	3580	0.30	9.1	580	1090	0.30
31.1	1830	3700	0.34	9.5	560	1130	0.34
32.4	1910	3390	0.27	9.9	580	1030	0.27
33.7	1960	3390	0.25	10.3	600	1030	0.25
35.0	1940	3580	0.29	10.7	590	1090	0.29
36.3	1940	4250	0.37	11.1	590	1290	0.37
37.6	1910	4370	0.38	11.5	580	1330	0.38
39.0	1890	4140	0.37	11.9	580	1260	0.37
40.3	1890	4030	0.36	12.3	580	1230	0.36
41.6	1880	4910	0.41	12.7	570	1500	0.41
42.9	1860	5410	0.43	13.1	570	1650	0.43
44.2	1800	5810	0.45	13.5	550	1770	0.45
45.5	1790	5500	0.44	13.9	550	1680	0.44
46.8	1760	5410	0.44	14.3	540	1650	0.44
48.1	1670	6030	0.46	14.7	510	1840	0.46
49.5	1750	5920	0.45	15.1	530	1800	0.45
50.8	1750	5920	0.45	15.5	530	1800	0.45
52.1	1720	6030	0.46	15.9	530	1840	0.46
53.4	1800	6150	0.45	16.3	550	1870	0.45
54.7	1810	6150	0.45	16.7	550	1870	0.45
56.0	1750	5920	0.45	17.1	530	1800	0.45
57.3	1720	6030	0.46	17.5	530	1840	0.46
58.6	1640	5920	0.46	17.9	500	1800	0.46

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole BH-POT-02

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p	
(ft)	(ft/s)	(ft/s)	
60.0	1490	5810	0.46
61.3	1460	6030	0.47
62.6	1540	6530	0.47
63.9	1670	7280	0.47
65.2	2180	8220	0.46
66.5	3090	9170	0.44
67.8	4030	10050	0.40
69.1	4310	10730	0.40
70.5	3880	10380	0.42
71.8	3500	10050	0.43
73.1	3310	10050	0.44
74.4	3460	10380	0.44
75.7	3700	11110	0.44
77.0	3120	10050	0.45
78.3	3090	9740	0.44
79.6	3060	9660	0.44
81.0	2790	9590	0.45
82.3	2690	9890	0.46
83.6	2650	8730	0.45
84.9	2630	8790	0.45
86.2	2520	8550	0.45
87.5	2480	8790	0.46
88.8	2460	8850	0.46
90.1	2560	9040	0.46
91.4	2420	8730	0.46
92.8	2400	8920	0.46
94.1	2200	8730	0.47
95.4	2020	8170	0.47
96.7	1900	7810	0.47
98.0	2080	7910	0.46
99.3	2160	7860	0.46
100.6	2210	7960	0.46
101.9	2210	7910	0.46
103.3	2180	7960	0.46
104.6	2110	8330	0.47
105.9	2060	8120	0.47
107.2	1990	7810	0.47
108.5	2060	7860	0.46
109.8	1990	7960	0.47
111.1	2060	7810	0.46

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p	
(m)	(m/s)	(m/s)	
18.3	450	1770	0.46
18.7	450	1840	0.47
19.1	470	1990	0.47
19.5	510	2220	0.47
19.9	660	2510	0.46
20.3	940	2800	0.44
20.7	1230	3060	0.40
21.1	1310	3270	0.40
21.5	1180	3160	0.42
21.9	1070	3060	0.43
22.3	1010	3060	0.44
22.7	1050	3160	0.44
23.1	1130	3380	0.44
23.5	950	3060	0.45
23.9	940	2970	0.44
24.3	930	2950	0.44
24.7	850	2920	0.45
25.1	820	3010	0.46
25.5	810	2660	0.45
25.9	800	2680	0.45
26.3	770	2610	0.45
26.7	760	2680	0.46
27.1	750	2700	0.46
27.5	780	2760	0.46
27.9	740	2660	0.46
28.3	730	2720	0.46
28.7	670	2660	0.47
29.1	610	2490	0.47
29.5	580	2380	0.47
29.9	630	2410	0.46
30.3	660	2400	0.46
30.7	670	2430	0.46
31.1	670	2410	0.46
31.5	670	2430	0.46
31.9	640	2540	0.47
32.3	630	2470	0.47
32.7	610	2380	0.47
33.1	630	2400	0.46
33.5	610	2430	0.47
33.9	630	2380	0.46

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole BH-POT-02

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p	
(ft)	(ft/s)	(ft/s)	
112.4	2200	8380	0.46

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p	
(m)	(m/s)	(m/s)	
34.3	670	2560	0.46

APPENDIX B

BORING GEOPHYSICAL LOGGING SYSTEMS - NIST TRACEABLE CALIBRATION RECORDS

MICRO PRECISION CALIBRATION, INC
2165 N. Glassell St.,
Orange, CA 92865
714-901-5659

AC-1969.03

Certificate of Calibration

Date: Feb 5, 2018 **Cert No. 512200813241307**

Customer:

GEOVISION

1124 OLYMPIC DRIVE
CORONA CA 92881

		Work Order #:	LA-90038210
		Purchase Order #:	OH-180202-01
MPC Control #:	BG9697	Serial Number:	19029
Asset ID:	19029	Department:	N/A
Gage Type:	LOGGER	Performed By:	TYLER MCKEEN
Manufacturer:	OYO	Received Condition:	IN TOLERANCE
Model Number:	3331-A	Returned Condition:	IN TOLERANCE
Size:	N/A	Cal. Date:	February 02, 2018
Temp/RH:	72.0°F / 54.0%	Cal. Interval:	12 MONTHS
Location:	Calibration performed at MPC facility	Cal. Due Date:	February 02, 2019

Calibration Notes:

See Attached Data Sheet (1 Page)

Calibrated IAW customer supplied data form Rev 2.1
Frequency measurement uncertainty = 0.0005 Hz
Unit calibrated with Panasonic Toughbook CF-29 Ser#: 4FKSA41798
Calibrated to 4:1 accuracy ratio.

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
BD7715	UNIVERSAL COUNTER	53131A	3416A05377	HEWLETT PACKARD	Nov 30, 2018	512200813230072
LAS0018	ARB / FUNC GENERATOR	33250A	US40001522	AGILENT TECHNOLOGIES	Dec 31, 2018	512200812632023
DB8748	GPS TIME AND FREQUENCY RECEIVER	58503A	3625A01225	HEWLETT PACKARD	Jun 16, 2019	512200812919221

Procedures Used in this Event

Procedure Name	Description
GEOVISION SEISMIC	Seismic Logger/Recorder Calibration Procedure, Rev. 2.1

Calibrating Technician: TYLER MCKEEN

QC Approval: JIM WILLIAMS

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, ANSI/NCSL Z540.3-2006, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.

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geophysical services

SUSPENSION PS SEISMIC LOGGER/RECORDER CALIBRATION DATA FORM

INSTRUMENT DATA

System mfg.:	Oyo	Model no.:	3331
Serial no.:	19029	Calibration date:	2/2/2018
By:	MicroPrecision	Due date:	2/2/2019
Counter mfg.:	Hewlett-Packard	Model no.:	53131A
Serial no.:	3416A05377	Calibration date:	11/10/2017
By:	Microprecision	Due date:	11/30/2018
Signal generator mfg.:	Agilent	Model no.:	33250A
Serial no.:	US40001522	Calibration date:	12/5/2017
By:	Microprecision	Due date:	12/31/2018
Laptop controller mfg.:	Panasonic	Model no.:	Toughbook CF-29
Serial no.:	4FKSA41798	Calibration date:	N/A

SYSTEM SETTINGS:

Gain:	10
Filter	20KHz
Range:	See sample period in table below
Delay:	0
Stack (1 std)	1
System date = correct date and time	2/2/2018 10:00am

PROCEDURE:

Set sine wave frequency to target frequency with amplitude of approximately 0.25 volt peak
Note actual frequency on data form.
Set sample period and record data file to disk. Note file name on data form.
Pick duration of 9 cycles using PSLOG.EXE program, note duration on data form, and save as .sps file. Calculate average frequency for each channel pair and note on data form.

Average frequency must be within +/- 1% of actual frequency at all data points.

Maximum error ((AVG-ACT)/ACT*100)% As found 0.60% As left 0.60%

Target Frequency (Hz)	Actual Frequency (Hz)	Sample Period (microS)	File Name	Time for 9 cycles Hn (msec)	Average Frequency Hn (Hz)	Time for 9 cycles Hr (msec)	Average Frequency Hr (Hz)	Time for 9 cycles V (msec)	Average Frequency V (Hz)
50.00	50.00	200	2	179.6	50.11	179.8	50.06	179.4	50.17
100.0	100.0	100	3	89.90	100.1	89.80	100.2	89.50	100.6
200.0	200.0	50	4	44.85	200.7	44.95	200.2	45.00	200.0
500.0	500.0	20	5	18.00	500.0	17.98	500.6	18.02	499.4
1000	1000	10	6	8.980	1002	9.000	1000.0	8.970	1003.3
2000	2000	5	7	4.500	2000	4.500	2000	4.495	2002

Calibrated by: Tyler McKeen 2/2/2018
Name Date Signature

Witnessed by: Emily Feldman 2/2/2018
Name Date Signature

Suspension PS Seismic Recorder/Logger Calibration Data Form Rev 2.1 February 7, 2012

GEOVision
geophysical services

REPORT

SURFACE WAVE MEASUREMENTS

MTA POTRERO FACILITY
SAN FRANCISCO, CALIFORNIA

GEO*Vision* Project No. 18113

Prepared for

Arup, Inc.
560 Mission Street, Suite 700
San Francisco, CA 94105
(415) 957-9445

Prepared by

GEO*Vision* Geophysical Services, Inc.
1124 Olympic Drive
Corona, California 92881
(951) 549-1234

Report 18113-02

May 2, 2018

TABLE OF CONTENTS

APPENDIX

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

In-situ seismic measurements using active and passive surface wave techniques were performed at the proposed locations of the MTA Potrero Facility, San Francisco, California from March 13th to March 16th, 2018. The primary purpose of the surface geophysical investigation was to map depth to bedrock beneath four seismic lines designated as Lines 1 through 4. The secondary purpose of the investigation was to provide a shear (S) wave velocity of the bedrock and overlying sediments and estimate the average S-wave velocity of the upper 30 m (V_{S30}). The active surface wave technique utilized during this investigation consisted of the multi-channel analysis of surface waves (MASW) method. The passive surface wave techniques consisted of the horizontal over vertical spectral ratio (HVSR), array microtremor, and refraction microtremor methods. Due to a thick surficial layer of asphalt and concrete, it was determined in the field that seismic refraction would not yield reliable results at the site. The geology in the vicinity of the seismic lines was expected to consist of sediments overlaying Franciscan Complex bedrock. The locations of the active and passive surface wave arrays are shown on Figure 1 and in Table 1.

V_{S30} is used in the NEHRP provisions and the Uniform Building Code (UBC) to separate sites into classes for earthquake engineering design (BSSC, 1994). The average shear wave velocity of the upper 100 ft (V_{S100ft}) is used in the International Building Code (IBC) for site classification. These site classes are as follows:

Class A – hard rock – $V_{S30} > 1500$ m/s (UBC) or $V_{S100ft} > 5{,}000$ ft/s (IBC)
Class B – rock – $760 < V_{S30} \leq 1500$ m/s (UBC) or $2{,}500 < V_{S100ft} \leq 5{,}000$ ft/s (IBC)
Class C – very dense soil and soft rock – $360 < V_{S30} \leq 760$ m/s (UBC)
or $1{,}200 < V_{S100ft} \leq 2{,}500$ ft/s (IBC)
Class D – stiff soil – $180 < V_{S30} \leq 360$ m/s (UBC) or $600 < V_{S100ft} \leq 1{,}200$ ft/s (IBC)
Class E – soft soil – $V_{S30} < 180$ m/s (UBC) or $V_{S100ft} < 600$ ft/s (IBC)
Class F – soils requiring site-specific evaluation

At many sites, active surface wave techniques (MASW) with the utilization of portable energy sources, such as hammers and weight drops, are sufficient to obtain a 30 m (100 ft) S-wave velocity sounding. At sites with high ambient noise levels and/or very soft soils, these energy sources may not be sufficient to image to 30 m and a larger energy source, such as a bulldozer, is necessary. Alternatively, passive surface wave techniques, such as the array microtremor technique or the refraction microtremor method of Louie (2001), can be used to extend the depth of investigation at sites that have adequate ambient noise conditions. It should be noted that two-dimensional passive surface wave arrays (e.g. triangular, circular, or L-shaped arrays) will perform better than linear arrays. However due to the expected high degree of lateral velocity variability and site constraints, two-dimensional passive surface wave arrays were not feasible.

This report contains the results of the active and passive surface wave measurements conducted at the site. An overview of the surface wave methods is given in Section 2. Field and data reduction procedures are discussed in Sections 3 and 4, respectively. Interpretation and results are presented in Section 5 and Section 6 presents our conclusions. References and our professional certification are presented in Sections 7 and 8, respectively.

2 OVERVIEW OF THE SURFACE WAVE METHODS

A discussion of active and passive surface wave methods is provided in the technical note included as Appendix A. Active surface wave techniques include the spectral analysis of surface waves (SASW) and multi-channel array surface wave (MASW) methods. Passive surface wave techniques include the array and refraction microtremor methods.

The basis of surface wave methods is the dispersive characteristic of Rayleigh and Love waves when propagating in a layered medium. The Rayleigh wave phase velocity, V_R, depends primarily on the material properties (V_S, mass density and Poisson's ratio or compression wave velocity) over a depth of approximately one wavelength. The Love wave phase velocity, V_L, depends primarily on V_S and mass density. Rayleigh and Love wave propagation are also affected by damping or seismic quality factor (Q).

Waves of different wavelengths, λ, (or frequencies, f) sample different depths. As a result of the variance in the shear stiffness of the layers, waves with different wavelengths travel at different phase velocities; hence, dispersion. A surface wave dispersion curve (dispersion curve) is the variation of V_R or V_L with λ or f.

The SASW and MASW methods are in-situ seismic method for determining shear wave velocity (V_S) profiles (Stokoe et al., 1994; Stokoe et al., 1989; Park et al., 1999a and 1999b, Foti, 2000). Surface wave techniques are non-invasive and non-destructive, with all testing performed on the ground surface at strain levels in the soil in the elastic range (< 0.001%). SASW testing consists of collecting surface wave phase data in the field, generating the dispersion curve, and then using iterative forward or inverse modeling to calculate the shear stiffness profile. MASW testing consists of collecting multi-channel seismic data in the field, applying a wavefield transform to obtain the dispersion curve, and data modeling.

A detailed description of the SASW field procedure is given in Joh, 1996. A vertical dynamic load is used to generate horizontally-propagating Rayleigh waves and a horizontal force is used to generate Love waves. The ground motions are monitored by two, or more, vertical (Rayleigh wave) or horizontal (Love wave) receivers and recorded by the data acquisition system capable of performing both time and frequency-domain calculations. Theoretical, as well as practical considerations, such as attenuation, necessitate the use of several receiver spacings to generate the dispersion curve over the wavelength range required to evaluate the stiffness profile. To minimize phase shifts due to differences in receiver coupling and subsurface variability, the source location is reversed. To develop a V_S model to a 30 meter depth using Rayleigh wave methods, energy sources typically include: small hammers (rock hammer or 3 lb hammer) for short receiver intervals; 10 to 20 lb sledgehammers for intermediate separations, and accelerated weight drops (AWD) or an electromechanical shaker for larger spacings. More energetic sources, such as bulldozers or seismic vibrators (Vibroseis^{TM}), can be used to conduct characterize velocity structure to depths of 100 m or more. Energy sources for shallow imaging using Love waves include a hammer and horizontal traction plank, portable hammer impact aluminum source, and inclined or horizontal accelerated weight drop systems. Energy sources for deeper imaging using Love waves include horizontal seismic vibrators. Generally, high frequency (short wavelength) surface waves are recorded across receiver pairs spaced at short intervals, whereas low frequency (long wavelength) surface waves require greater spacing between

receivers. Dispersion data averaged across greater distances are often smoother because effects of localized heterogeneities are averaged.

After the time-domain motions from the two receivers are converted to frequency-domain records using the Fast Fourier Transform, the cross power spectrum and coherence are calculated. The phase of the cross power spectrum, ϕ_w (f), represents the phase differences between the two receivers as the wave train propagates past them. It ranges from $-\pi$ to π in a wrapped form and must be unwrapped through an interactive process called masking. Phase jumps are specified, near-field data (wavelengths longer than two times the distance from the source to first receiver) and low-coherence data are removed. The experimental dispersion curve is calculated from the unwrapped phase angle and the distance between receivers by:

$$V_{R/L} = f * d_2/(\Delta\phi/360°)$$

where V_R = Rayleigh wave phase velocity
V_L = Love wave phase velocity
f = frequency
d_2 = distance between receivers
$\Delta\phi$ = the phase difference in degrees

A detailed description of the MASW method is given by Park, 1999a and 1999b. Ground motions are recorded by 24 or more geophones spaced 1 to 3 m apart and aligned in a linear array and connected to a seismograph. Energy sources are the same as those outlined above for SASW testing. When applying the MASW technique to develop a one-dimensional (1-D) V_S model, the surface-wave data preferably is acquired using multiple-source offsets at both ends of the array. Rayleigh and Love wave MASW acquisition can easily be combined with P- and S-wave seismic refraction acquisition, respectively. A wavefield transform is applied to the time-history data to convert the seismic record from time-offset space to phase velocity-frequency space in which the surface-wave dispersion curve can be easily identified. Common wave-field transforms include the frequency-wavenumber (f-k) transform, slant-stack transform (τ-p), frequency domain beamformer, and phase-shift transform.

A detailed discussion of the array microtremor method can be found in Okada, 2003. This technique uses 4, or more receivers aligned in a 2-dimensional array. Triangle, circle, semi-circle, and "L" shaped arrays are commonly used, although any 2-dimensional arrangement of receivers can be used. For investigation of the upper 100 m, receivers typically consist of 1 to 4.5 Hz geophones. The triangle array, which consists of several embedded equilateral triangles, is often used as it provides good results with a relatively small number of geophones. With this array, the outer side of the triangle should be at least equal to the desired depth of investigation. The "L" array is useful at sites located at the corner of perpendicular intersecting streets. Typically 20, or more, 30-second noise records are acquired for analysis. The surface wave dispersion curve is typically estimated from array microtremor data using various f-k methods such as beam-forming (Lacoss, *et al*., 1969) and maximum-likelihood (Capon, 1969); and the spatial-autocorrelation (SPAC) method, which was originally based on work by Aki, 1957. The SPAC method has since been extended and modified (Ling and Okada, 1993 and Ohori *et al*., 2002) to permit the use of noncircular arrays, and is now collectively referred to as extended spatial autocorrelation (ESPAC or ESAC).

The refraction microtremor technique (ReMi™), a detailed description of which can be found in Louie, 2001, differs from the more established array microtremor technique in that it uses a linear receiver array rather than a two dimensional array. Unlike the SASW method, which uses an active energy source (i.e. hammer), the microtremor technique records background noise emanating from ocean wave activity, wind noise, traffic, industrial activity, construction, etc. Refraction microtremor field procedures typically consist of laying out a linear array of 24, or more, 4.5 Hz geophones and recording 20, or more, 30 second noise records. These noise records are reduced using the software package SeisOpt® ReMi™ v2.0 by Optim™ Software and Data Services. This package is used to generate and combine the slowness (p) – frequency (f) transform of the noise records. The surface wave dispersion curve is picked at the lower envelope of the surface wave energy identified in the p-f spectrum. It should be noted that other data reduction techniques such as seismic interferometry and extended spatial autocorrelation (ESAC) can also be used to extract surface wave dispersion curves from linear array, passive surface wave data.

The horizontal-to-vertical spectral ratio (H/V spectral ratio or HVSR) technique was first introduced by Nogoshi and Igarashi (1971) and popularized by Nakamura (1989). This technique utilizes single-station recordings of ambient vibrations (microtremor or noise) made with a three-component seismometer. In this method, the ratio of the Fourier amplitude spectra of the horizontal and vertical components is calculated to determine the frequency of the maximum HVSR response (HVSR peak frequency), commonly accepted as an approximation of the fundamental frequency (f_0) of the sediment column overlying bedrock. The HVSR peak frequency associated with bedrock is a function of the bedrock depth and S-wave velocity of the sediments overlying bedrock. The theoretical HVSR response can be calculated for an S-wave velocity model using modeling schemes based on surface wave ellipticity, vertically propagating body waves, or diffuse wavefields containing body and surface waves. The HVSR frequency peak can also be estimated using the quarter-wavelength approximation:

$$f_0 = \frac{\overline{V}_S}{4z}$$

where f_0 is the site fundamental frequency and $\overline{V}_S$ is the average shear-wave velocity of the soil column overlying bedrock at depth z.

The active and passive surface wave techniques complement one another as outlined below:

- SASW/MASW techniques image the shallow velocity structure which cannot be imaged by the microtremor technique and is needed for an accurate V_{S30}/V_{S100ft} estimate.
- Microtremor techniques work best in noisy environments where SASW/MASW depth investigation may be limited.
- In a noisy environment the microtremor technique will usually extend the depth of an SASW/MASW sounding.
- The degree of fit in the overlapping portion of the dispersion curves from the two techniques provides a level of confidence in the results.

The dispersion curves generated from the active and passive surface wave soundings are generally combined and modeled using iterative forward and inverse modeling routines. The

final model profile is assumed to represent actual site conditions. Several options exist for the Rayleigh wave forward solution: a formulation that takes into account only fundamental-mode Rayleigh wave motion; one that includes all stress waves and incorporates receiver geometry in an SASW test named the 3-D solution (Roesset et al., 1991); one that computes an effective mode for an MASW test but assumes a plane Rayleigh wave and no body wave effects and a multi-mode solution that models different Rayleigh wave modes. Both fundamental mode and multi-mode forward solutions are available for modeling of Love wave data.

The theoretical model used to interpret the dispersion assumes horizontally layered, laterally invariant, homogeneous-isotropic material. Although these conditions are seldom strictly met at a site, the results of active and/or passive surface wave testing provide a good "global" estimate of the material properties along the array. The results may be more representative of the site than a borehole "point" estimate.

It may not always be possible to develop a coherent, fundamental mode dispersion curve over sufficient frequency range for modeling from MASW or SASW data due to dominant higher modes with the higher modes not clearly identifiable for multi-mode modeling. It may, however, be possible to identify the Rayleigh wave phase velocity of the fundamental mode at 40 m wavelength (V_{R40}) in which case V_{S30} can at least be estimated using the Brown et al., 2000 relationship:

$$V_{S30} = 1.045 V_{R40}$$

This relationship was established based on statistical analysis of a large number of surface wave data sets from sites with control by velocities measured in nearby boreholes and has been further tested by Martin and Diehl, 2004, and Albarello and Gargani, 2010.

As with all surface geophysical methods, inversion of surface wave dispersion data does not yield a unique V_S model and there are multiple possible solutions that may equally well fit the experimental data. Based on our experience at other sites, the shear wave velocity models (V_S and layer thicknesses) determined by surface wave testing are within 20% of the velocities and layer thicknesses that would be determined by other seismic methods [Brown, 1998]. The average velocity of the upper 30 m or 100 ft, however, is much more accurate, often to better than 5%, because it is not sensitive to the layering in the model. V_{S30} does not appear to suffer from the non-uniqueness inherent in V_S models derived from surface wave dispersion curves (Martin et al., 2006, Comina et al., 2011). Therefore, V_{S30} is more accurately estimated from inversion of surface wave dispersion data than the resulting V_S models.

3 FIELD PROCEDURES

Four (4) profiles were established at the site and designated as Lines 1 through 4. The endpoints of the geophysical profiles were marked in the field and surveyed by **GEO***Vision* staff using a Trimble ProXRS GPS with OmniStar submeter corrections. All geophone and shot point locations were measured using a 100 meter tape measure. The locations of the geophysical traverses are presented in Figure 1 and tabulated in Table 1. Active surface wave data were acquired using the MASW technique. Passive surface wave data were acquired using the array and refraction microtremor method. HVSR measurements were made near borehole locations and nominally at the center of the surface wave arrays.

A typical MASW field layout is shown in Appendix A. MASW equipment used during this investigation consisted of two Geometrics Geode signal enhancement seismographs, 4.5 Hz vertical geophones, seismic cable, 20 lb sledgehammer, and an aluminum plate. MASW data were acquired along linear arrays of 48 geophones spaced 1.5 to 2.5 m apart. Shot points were located up to 9 m from the end geophone locations, as space was available and at every second geophone interval along the array. The 20 lb sledgehammer was used for the offset source locations and interior source locations. Data from the transient impacts (hammers) were averaged 5 times, or more, to improve the signal-to-noise ratio. Photographs of typical MASW equipment are presented in Appendix A. All seismic records were stored on a laptop computer with file names and acquisition parameters documented on a field log.

The passive surface wave equipment consisted of two Geometrics Geode signal enhancement seismographs, 4.5 Hz vertical geophones, and seismic cables. Passive surface wave data were acquired along linear arrays of 48, 4.5 Hz geophones coincident with the MASW arrays. Ambient noise measurements were made along these arrays for at least 30 minutes at a 2 ms sample rate (60+, 30 second records). All passive surface wave data were stored on a laptop computer for later processing. The field geometry and associated files names were documented in field data acquisition forms.

HVSR data were acquired at a seven locations on site (Figure 1) utilizing either a Nanometrics Trillium Compact 120 second seismometer coupled to a Nanometrics Centaur data acquisition unit (referred to herein as Trillium) and a Micromed Tromino® ENGY (herein referred to as Tromino). Microtremor measurements were made for at least 30 minutes at each measurement location with data recorded at 100 samples per second with the Trillium and 128 samples per second with the Tromino. Microtremor data were stored in the data acquisition system and downloaded as Miniseed or ASCII format files at the end of data acquisition.

4 DATA REDUCTION AND MODELING

HVSR data were reduced using the Geopsy Version 2.9.1 software package (http://www.geopsy.org) developed by Marc Wathelet, ISTerre, Grenoble, France with the help of many other researchers.

Microtremor data recorded by the Trillium were exported to miniseed format and the Tromino data were exported to an ASCII file using the software package Grilla, provided with the instrument. The data file was then loaded into the Geopsy software package, where data file columns containing the vertical and horizontal (north and east) components and the sample rate were specified. HVSR was typically calculated over a frequency range dependent upon the observed site response and using a time window length of 90 s. Time windows were automatically picked. Fourier amplitude spectra were calculated after applying a 5% cosine taper and smoothed by the Konno and Ohmachi filter with a smoothing coefficient value of 40. The vertical amplitude spectra were divided by the root-mean-square (RMS) of the horizontal amplitude spectra to calculate the HVSR for each time window and the average HVSR. Time windows containing clear transients (nearby foot or vehicular traffic) or yielding poor quality results were then deleted and the computations repeated. The average HVSR peak frequency and standard deviation from all time windows used for analysis were computed and presented along with the standard deviation of the HVSR amplitudes for all time windows.

The 2D MASW data were reduced using the software Seisimager/SW developed by Geometrics, Inc. and Seismic Pro Surface V8 developed by Geogiga using the following steps:

- Input all seismic records collected along a profile and geometry into Seisimager.
- Calculate cross correlation of all pairs of receivers over a multiple user-defined offset ranges and sort by the midpoint of the receiver a pair.
- Combine cross correlations gathers with different receiver spacings, specific offset range, and a common midpoint at 15 or 16 m (~50 ft) intervals along each profile, outputting the data file.
- Input common midpoint cross correlation gather seismic records into Seismic Pro Surface software.
- Apply wavefield transform to seismic record to convert the data from time – offset to phase velocity – frequency space.
- Identify and pick Rayleigh wave dispersion curve.
- Repeat for all shot records.
- Apply near-field criteria (maximum wavelength equal 1 to 1.3 times the source to midpoint of receiver array distance).
- Merge multiple dispersion curves associated with the same receiver midpoint (i.e. position along the profile at 15 or 16 m (~50 ft) intervals) but different offset ranges used for the cross correlation gathers, as necessary.

Array and refraction microtremor data were extracted along 30 m intervals of the seismic lines which were approximately centered at the midpoint of the MASW cross correlation gathers. The array microtremor data were reduced using the software Seisimager SW developed by Oyo Corporation/Geometrics, Inc. and the following steps:

- Input all seismic records for a dataset into software.
- Load geometry (x and y positions) for each channel in seismic records.
- Calculate the SPAC coefficients for each seismic record and average.
- For each frequency calculate the RMS error between the SPAC coefficients and a Bessel function of the first kind and order zero over a user defined phase velocity range and velocity step.
- Plot an image of RMS error as a function for frequency (f) and phase velocity (v).
- Identify and pick the dispersion curve as the continuous trend on the f-v image with the lowest RMS error.
- Convert dispersion curves to appropriate format for modeling.
- Combine multiple passive dispersion curves, as appropriate.
- Calculate a representative dispersion curve for the passive dispersion data using a moving average polynomial curve fitting routine.

The refraction microtremor data were reduced using the Optim™ Software and Data Services SeisOpt® ReMi™ v5.0 data analysis package. Data reduction steps included the following:

- Conversion of SEG-2 format field files to SEG-Y format.
- Data preprocessing which includes trace-equalization gaining and DC offset removal.
- Erasing receiver geometry present in the file header.
- Computing the velocity spectrum of each record by p-f transformation.
- Combining the individual p-f transforms into one image.
- Picking and saving the velocity spectrum image.
- Reformat dispersion data to input format for modeling software.

The Rayleigh wave dispersion curves from various coincident data sets were combined (all MASW and passive dispersion data for a 1D sounding or all data with the midpoint of the receiver array over a user defined position range along a profile) to form a composite dispersion curve. Composite dispersion curves were generated at 15 m intervals along Lines 1, 3, and 4, and at 16 m intervals along Line 2. A total of 20 composite dispersion curves were developed for modeling along the profiles. A representative dispersion curve was calculated for each composite dispersion curve using the moving average polynomial curve fitting routine in the software package WinSASW V3.

An iterative forward and inverse modeling process was used to generate an S-wave velocity model for each representative dispersion curve. During this process an initial velocity model was generated based on general characteristics of the dispersion curve. The dispersion curve for this model was then calculated and compared to the observed dispersion curves. Adjustments were then made to the model parameters (layer thickness and V_S) manually (forward modeling) and automatically (inverse modeling) until an acceptable agreement with the observed data was obtained. Rayleigh wave dispersion data were modeled using the fundamental and effective mode forward and inverse modeling routine in the WinSASW V3 software package.

Data inputs into the Rayleigh wave modeling software include layer thickness, S-wave velocity, P-wave velocity, and mass density. Because the primary purpose of this investigation was to

develop 2D images of velocity structure along several profiles, models had about twice the number of layers typically used for modeling.

P-wave velocity and mass density only have a very small influence (i.e. less than 10%) on the S-wave velocity model generated from a surface wave dispersion curve. However, realistic assumptions for P-wave velocity, which is significantly impacted by the location of the saturated zone, and mass density will slightly improve the accuracy of the S-wave velocity model.

Constant mass density values of 1.9 to 2.2 g/cm^3 were used in the profile for subsurface soils/rock depending on P- and S-wave velocity. Within the normal range encountered in geotechnical engineering, variation in mass density has a negligible (±2%) affect on the estimated V_S from surface wave dispersion data. During modeling of Rayleigh wave dispersion data, the compression wave velocity, V_P, for unsaturated sediments was estimated using a Poisson's ratio, ν, of 0.3 and the relationship:

$$V_P = V_S \left[(2(1-\nu))/(1-2\nu)\right]^{0.5}$$

Poisson's ratio has a larger affect than density on the estimated V_S from Rayleigh wave dispersion data. Achenbach (1973) provides approximate relationship between Rayleigh wave velocity (V_R), V_S and ν:

$$V_R = V_S \left[(0.862 + 1.14\,\nu)/(1+\nu)\right]$$

Using this relationship, it can be shown that V_S derived from V_R only varies by about 10% over possible 0 to 0.5 range for Poisson's ratio where:

$V_S = 1.16V_R$ for $\nu = 0$
$V_S = 1.05V_R$ for $\nu = 0.5$

The realistic range of the Poisson's ratio for typical unsaturated sediments is about 0.25 to 0.35. Over this range, V_S derived from modeling of Rayleigh wave dispersion data will vary by about 5%. An intermediate Poisson's ratio of 0.3 was selected for modeling to minimize any error associated with the assumed Poisson's ratio.

To reduce errors associated with expected high Poisson's ratio of saturated sediments, the saturated zone was anchored at an assumed depth of about 33 ft, based on borehole data provided by Arup, Inc., when modeling the surface wave dispersion data. Poisson's ratio of the saturated zone was set to about 0.46 depending on the modeled S-wave velocity (e.g. higher velocity sediments expected to have a lower Poisson's ratio in the saturated zone).

5 INTERPRETATION AND RESULTS

S-wave velocity models were developed at nominal 50 ft intervals along each profile. A sample of the developed 1D S-wave velocity model is presented as Figure 2. The velocity models were combined and color enhanced contour maps developed to present the S-wave velocity structure beneath each profile. S-wave velocity models for Lines 1 to 4 are presented in Figures 3, 4, 5, and 6, respectively.

The Rayleigh wave phase velocities from the shallower MASW and deeper passive surface wave measurements were generally found to be in good agreement in the region of overlapping wavelengths as shown on Figure 2. The velocity models developed for each representative dispersion curve reflect the average velocity structure beneath the arrays. For MASW and passive surface wave data collected along Lines 1 to 4, the velocity models generally reflect the average velocity structure beneath approximate 100 ft segments of the profiles centered on the measurement locations, which was necessary to achieve the desired depth of investigation. It should be noted that the V_S models only shown to approximately 50 ft from the end locations of the seismic lines. Depth of investigation of the models is about 100 ft.

The S-wave velocity of the Franciscan complex is not well constrained by the surface wave V_S models. The PS Suspension log from **GEO***Vision* Report 18113-01 indicates that the velocity of the Franciscan complex may be highly variable and contain velocity inversions (higher velocity material overlying lower velocity material) at this site. Surface wave techniques cannot resolve such structures at depth and, therefore, velocities are likely more representative of the rocks average velocity structure. The resolution decreases gradually with depth due to the loss of sensitivity of the dispersion curve to changes in V_S at greater depth. The surface wave V_S models should only be used to determine the approximate depth Franciscan complex. The surface wave phase velocity data was degraded in the northwestern portion of the site where bedrock is shallowest due to probable higher modes influence on the surface wave phase velocity data.

In general, the subsurface velocity structure consists of the surficial layer of sediments with a S-wave velocity of about 1,200 ft/s or less. Followed by a thicker zone of sediments with a S-wave velocity ranging from greater than 1,200 ft/s to 1,800 ft/s. The top of Franciscan complex bedrock corresponds with the 2,000 to 2,200 ft/s velocity contours and have been interpreted to approximately track the 2,000 ft/s contour shown on S-wave velocity models for discussion purposes. The contact of the sediments and Franciscan generally deepens to the south and west along the V_S profiles.

The V_S model for Line 1 is presented as Figure 3. Seismic velocity increases to 2,000 ft/s at a depth of about 38 ft beneath western end of the model, about 22 ft beneath the central portion of the model, and 19 ft beneath the eastern portion of the model. The average S-wave velocity of the upper 30 m (V_{S30}) ranges from about 566 at the western portion to 743 ft/s at the eastern portion of the model.

The V_S model for Line 2 is presented as Figure 4. Seismic velocity increases to 2,000 ft/s at a depth of about 40 ft beneath southern end of the model, about 30 ft beneath the central portion of the model, and 18 ft beneath the northern end of the model. The average S-wave velocity of the

upper 30 m ranges from about 567 at the southern portion of the model to 705 ft/s at the northern portion of the model.

The V_S model for Line 3 is presented as Figure 5. Seismic velocity increases to 2,000 ft/s at a depth of about 65 ft beneath western end of the model, about 56 ft beneath the central portion of the model, and 47 ft beneath the eastern end of the model. The average S-wave velocity of the upper 30 m ranges from about 479 at the western portion of the model to 516 ft/s at the eastern portion of the model.

The V_S model for Line 4 is presented as Figure 6. Seismic velocity increases to 2,000 ft/s at a depth of about 69 ft beneath southern end of the model, about 57 ft beneath the central portion of the model, and 48 ft beneath the northern end of the model. The average S-wave velocity of the upper 30 m ranges from about 478 at the southern portion of the model to 552 ft/s at the northern portion of the model.

The observed HVSR data for locations HV1 to HV7 are presented in Figures 7 and 8. The HVSR data collected at the seven locations are very similar, indicating that even the more subtle features likely have geologic origin. The dominant feature in the HVSR data is a high amplitude peak at a frequency of ranging from about 1.8 to 2.1 Hz, which is likely associated with an S-wave velocity structure at a greater depth than the sediment and Franciscan complex contact. However, the HVSR peak frequency is an approximation of the fundamental site frequency and is likely related to Franciscan becoming competent bedrock. Additionally, there is subtle, lower amplitude, high frequency HVSR peak at a frequency of range of about 10 to 12 Hz observed at HV4, HV5, and HV7. This peak may be related to the increase in S-wave velocity associated with the top of shallow Franciscan complex along this portion of the site.

6 CONCLUSIONS

Active and passive surface wave measurements were performed at the proposed locations of the MTA Potrero Facility, San Francisco, California. The primary purpose of the surface geophysical investigation was to map depth to bedrock beneath four seismic lines designated as Lines 1 through 4. The secondary purpose of the investigation was to provide a shear (S) wave velocity of the bedrock and overlying sediments and estimate the average S-wave velocity of the upper 30 m (V_{S30}). The active surface wave technique utilized during this investigation consisted of the multi-channel analysis of surface waves (MASW) method. The passive surface wave techniques consisted of the horizontal over vertical spectral ratio (HVSR), array microtremor, and refraction microtremor methods. The locations of the geophysical testing arrays are presented in Figure 1 and Table 1.

Color enhanced contour maps were developed to present the S-wave velocity structure beneath each profile. S-wave velocity models for Lines 1 to 4 are presented in Figures 3, 4, 5, and 6, respectively. The top of Franciscan complex bedrock is interpreted to approximately correspond to the 2,000 to 2,200 ft/s velocity contours shown on S-wave velocity models. The contact of the sediments and Franciscan generally deepens to the south and west along the V_S profiles. The velocities of the Franciscan complex may be highly variable and contain velocity inversions at this site. Therefore, velocities of the Franciscan derived from the surface wave techniques likely are more representative of the average rock velocities. Depth of investigation of the models is about 100 ft.

Observed HVSR data are presented as Figures 7 and 8. The dominant feature in the HVSR data is a high amplitude peak at a frequency of ranging from about 1.8 to 2.1 Hz, which is likely associated with an S-wave velocity structure at a greater depth than the sediment and Franciscan complex contact. However, the HVSR peak frequency is related to the fundamental site frequency which is likely related to Franciscan becoming competent bedrock at depth beneath the site.

The average S-wave velocity of the upper 30 m (V_{S30}) ranges from about 478 to 743 ft/s. Therefore, according to the Uniform and International Building Codes, the area in the vicinity of the surface wave arrays is classified as Class C, very dense soil and soft rock.

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Stokoe, K.H., II, Rix, G.L. and S. Nazarian, 1989, "In situ seismic testing with surface waves*" Proceedings, Twelfth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1,* Rio de Janeiro, Brazil*,* pp. 330-334.

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8 CERTIFICATION

All geophysical data, analysis, interpretations, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by a **GEO*Vision*** California Professional Geophysicist.

Prepared by

5/2/2018

David Carpenter — Date
California Professional Geophysicist, P.Gp. 1088
GEO*Vision* Geophysical Services

* This geophysical investigation was conducted under the supervision of a California Professional Geophysicist using industry standard methods and equipment. A high degree of professionalism was maintained during all aspects of the project from the field investigation and data acquisition, through data processing interpretation and reporting. All original field data files, field notes and observations, and other pertinent information are maintained in the project files and are available for the client to review for a period of at least one year.

  A professional geophysicist's certification of interpreted geophysical conditions comprises a declaration of his/her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations or ordinances.

TABLES

TABLE 1 Location of Geophysical Arrays

Location	Easting	Northing
Line 1, Distance = 0 ft	6,009,538	2,106,323
Line 1, Distance = 231 ft	6,009,769	2,106,332
Line 2, Distance = 0 ft	6,009,789	2,106,011
Line 2, Distance = 308 ft	6,009,771	2,106,320
Line 3, Distance = 0 ft	6,009,551	2,105,976
Line 3, Distance = 231 ft	6,009,782	2,105,992
Line 4, Distance = 0 ft	6,009,589	2,105,969
Line 4, Distance = 385 ft	6,009,573	2,106,354
HV1 Location	6,009,553	2,106,322
HV2 Location	6,009,611	2,106,020
HV3 Location	6,009,578	2,106,145
HV4 Location	6,009,717	2,106,243
HV5 Location	6,009,783	2,106,185
HV6 Location	6,009,663	2,106,323
HV7 Location	6,009,767	2,106,331

Note: Coordinates in California State Plane Coordinate System, NAD83 Zone 3 (0403), US Survey Feet.

FIGURES

Legend

- Active and Passive Surface Wave Array
- H/V

NOTES:
1. California State Plane Coordinate System, NAD 83, Zone VI (0406), US Survey Feet
2. Base map source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

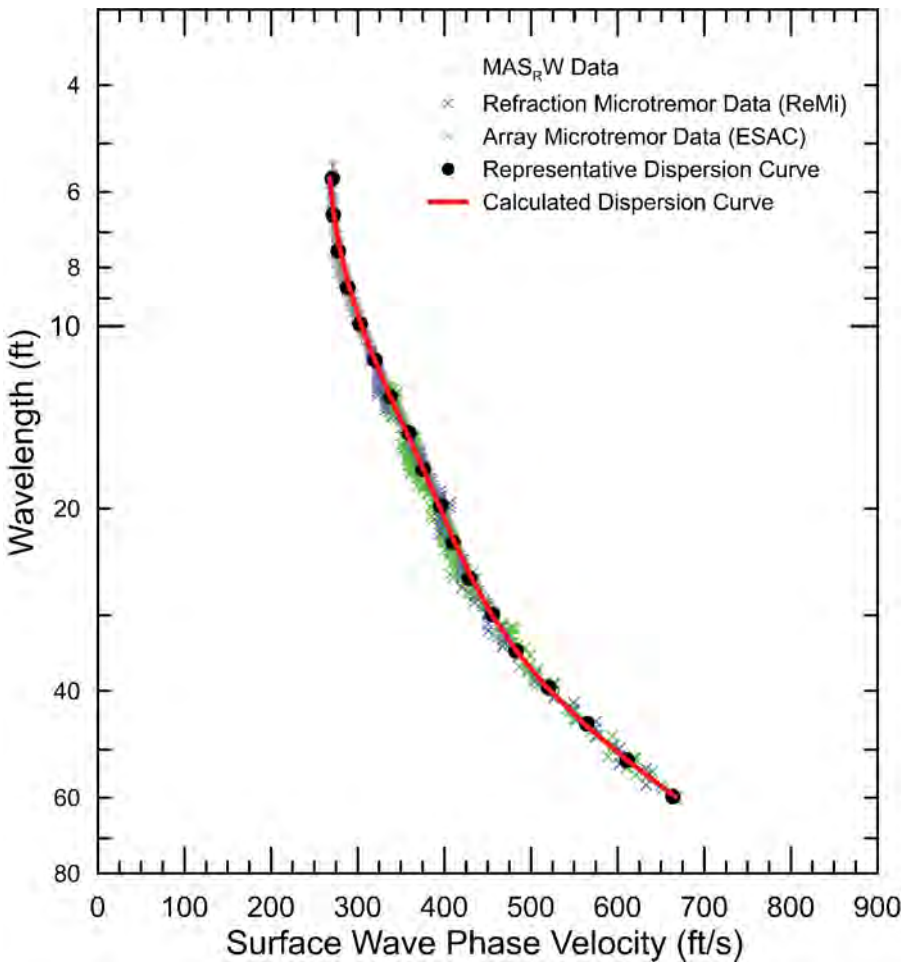
GEOVision geophysical services

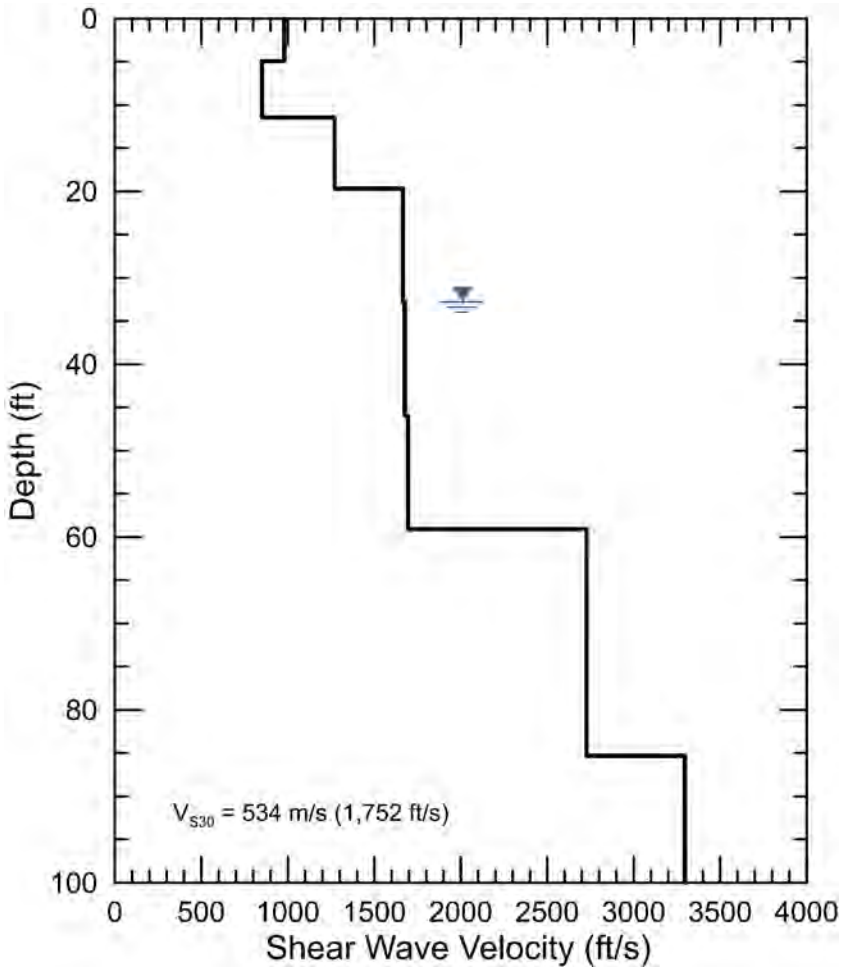
Date:	4/5/2018
GV Project:	17465
Developed by:	D Carpenter
Drawn by:	T Rodriguez
Approved by:	A Martin
File Name:	18113_1.MXD

FIGURE 1
SITE MAP

SITE LOCATED AT
MTA POTRERO SITE
SAN FRANCISCO, CALIFORNIA

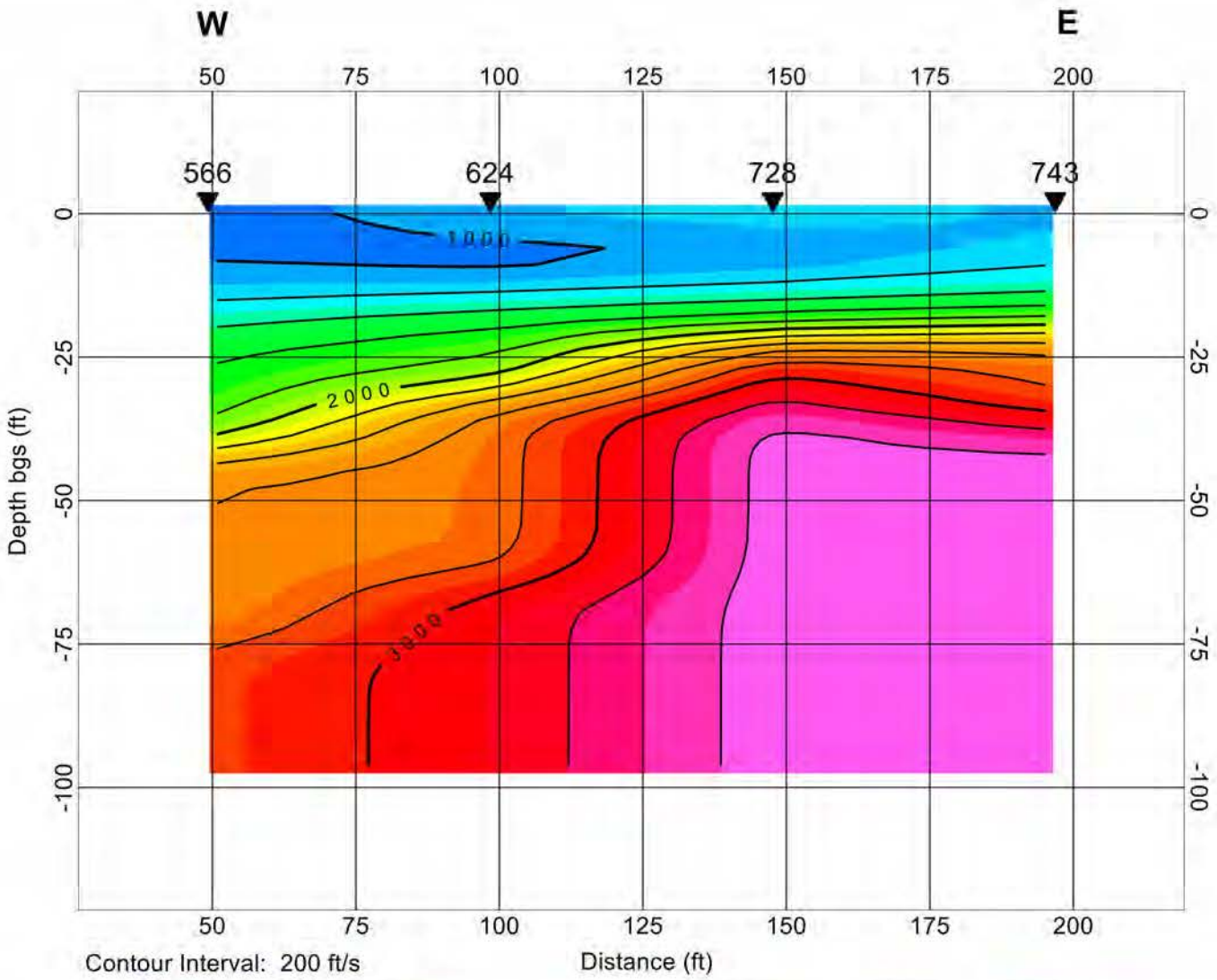
PREPARED FOR
ARUP NORTH AMERICA LTD

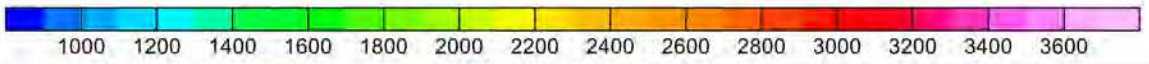




Line 4 Distance 197 ft - Field, representative and calculated surface wave dispersion data (left) and associated V_S model (right)

GEOVision geophysical services	Figure 2 Sample 1D Surface Wave Model - Line 4 Distance 197 ft Active and Passive Surface Wave Arrays
Project No.: 18113	MTA Potrero Site San Francisco, California
Date: May 1, 2018	
Drawn By: D. Carpenter	
Approved By: D. Carpenter	Prepared for Arup, Inc.
File P:\Project Files\2018\18113-Arup San Fran...\Report\Figure2.cdr	





S-Wave Velocity
(ft/s)

LEGEND

743 ▼ Sounding Location and Vs30 (m/s)

25 0 25
(feet)

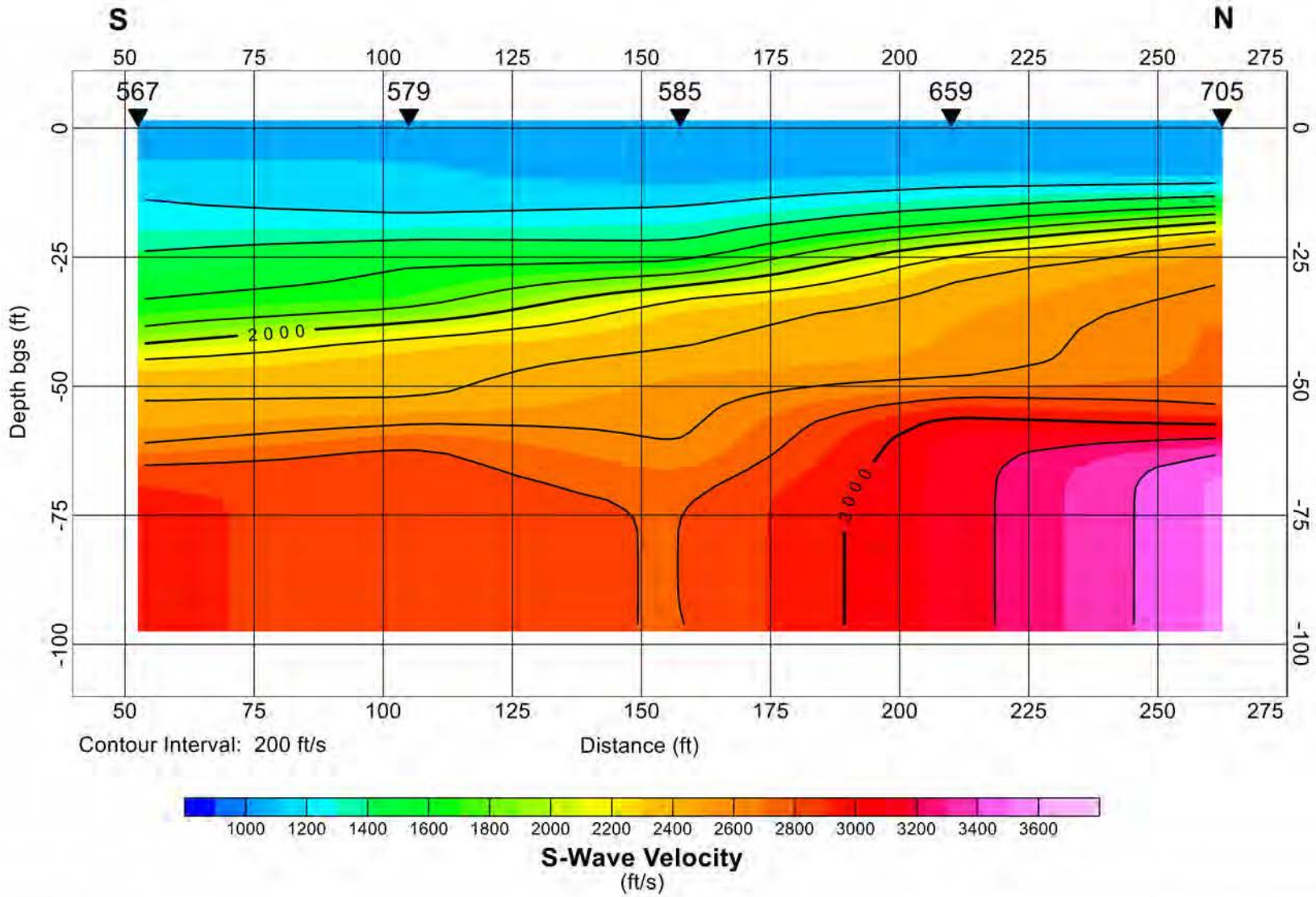
GEOVision geophysical services

Figure 3

Line 1: S-Wave Velocity Model
GV Project No. 18113

MTA Potrero Site
San Francisco, CA

Prepared for Arup, Inc.



LEGEND

705 ▼ Sounding Location and Vs30 (m/s)

25 0 25
(feet)

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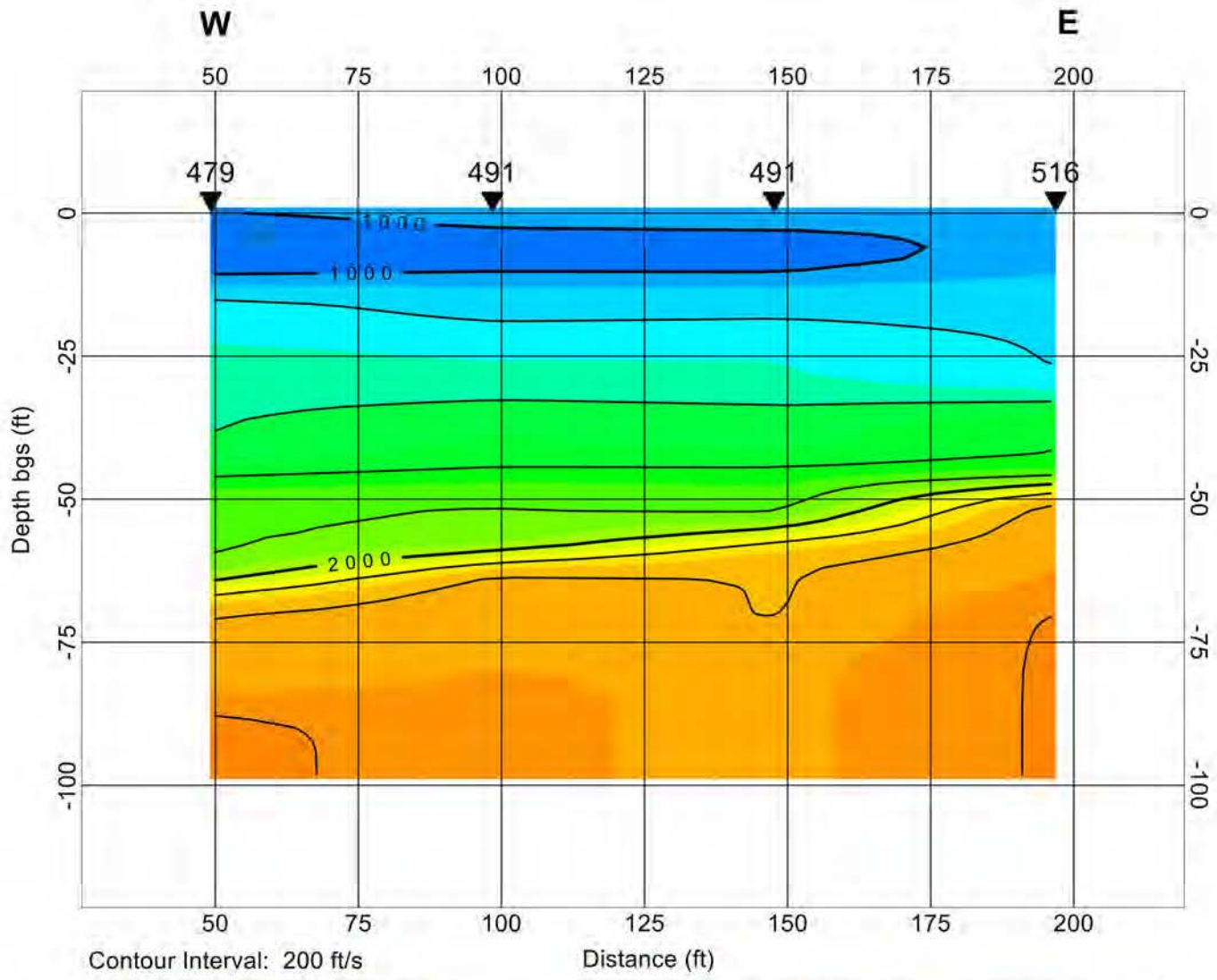
Figure 4

Line 2: S-Wave Velocity Model
GV Project No. 18113

MTA Potrero Site
San Francisco, CA

Prepared for Arup, Inc.



LEGEND

552 ▼ Sounding Location and Vs30 (m/s)

25 0 25
(feet)

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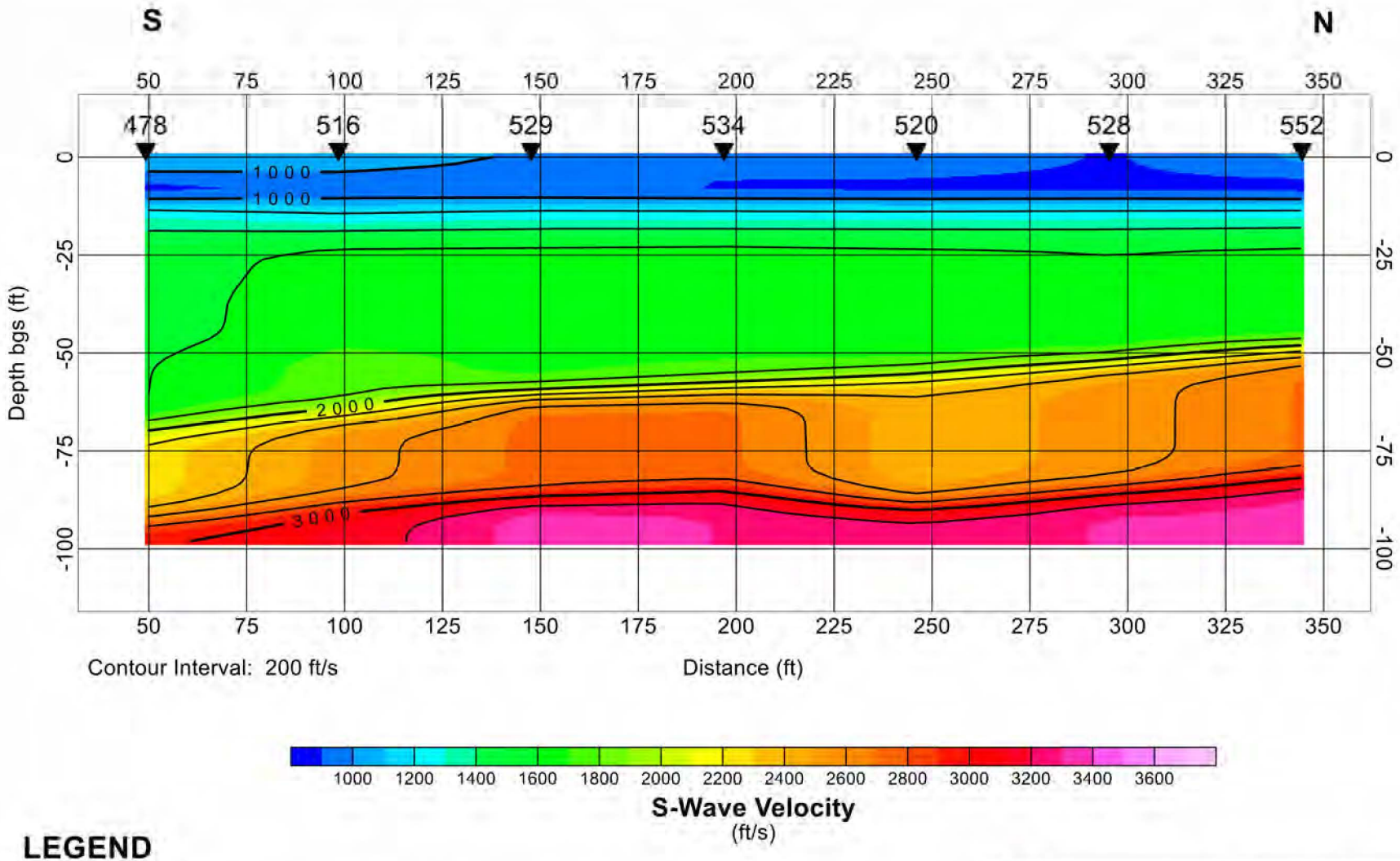
Figure 5

Line 3: S-Wave Velocity Model
GV Project No. 18113

MTA Potrero Site
San Francisco, CA

Prepared for Arup, Inc.



LEGEND

552 ▼ Sounding Location and Vs30 (m/s)

25 0 25 50
(feet)

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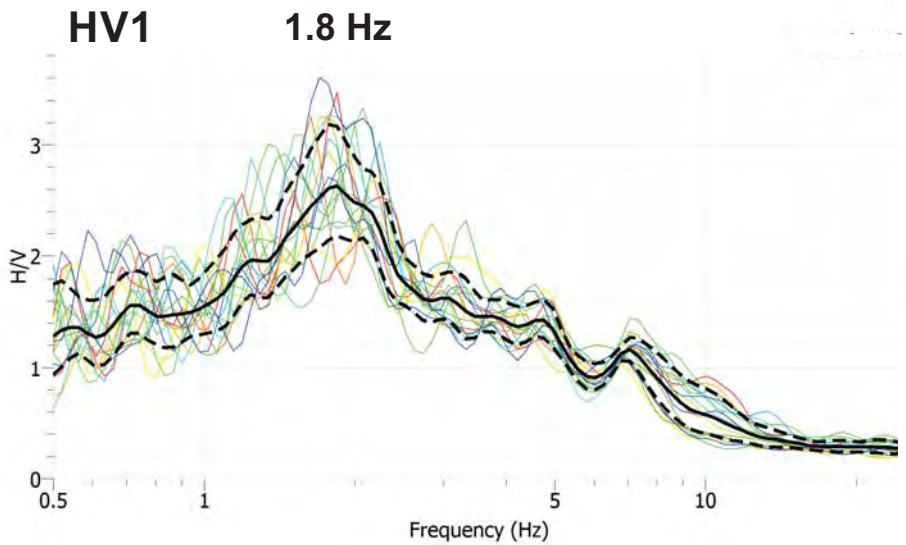
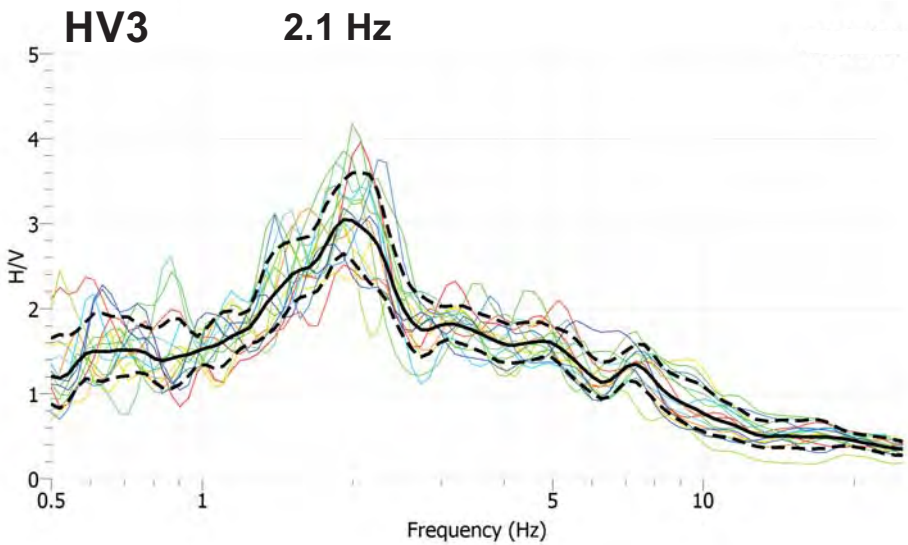
Figure 6

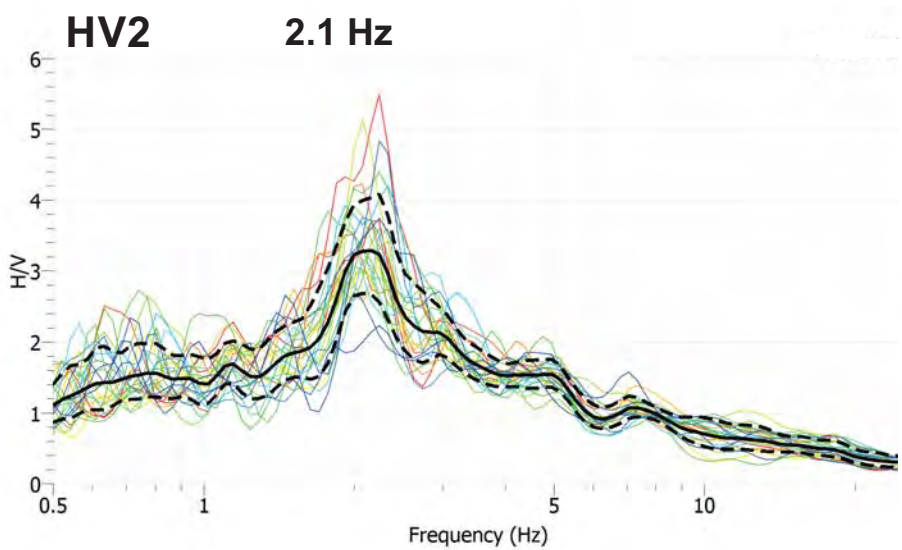
Line 4: S-Wave Velocity Model
GV Project No. 18113

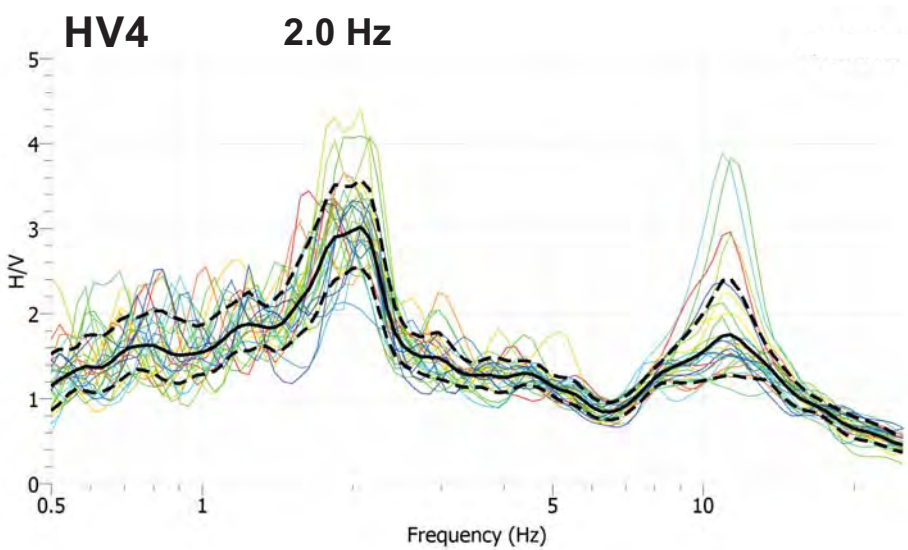
MTA Potrero Site
San Francisco, CA

Prepared for Arup, Inc.









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Project No.: 18113	Figure 7 HVSR Data - Stations HV1 to HV4
Date: May 1, 2018	Site Located at MTA Potrero Facility San Francisco, California
Drawn By: D. Carpenter	
Approved By: A. Martin	Prepared for Arup, Inc.

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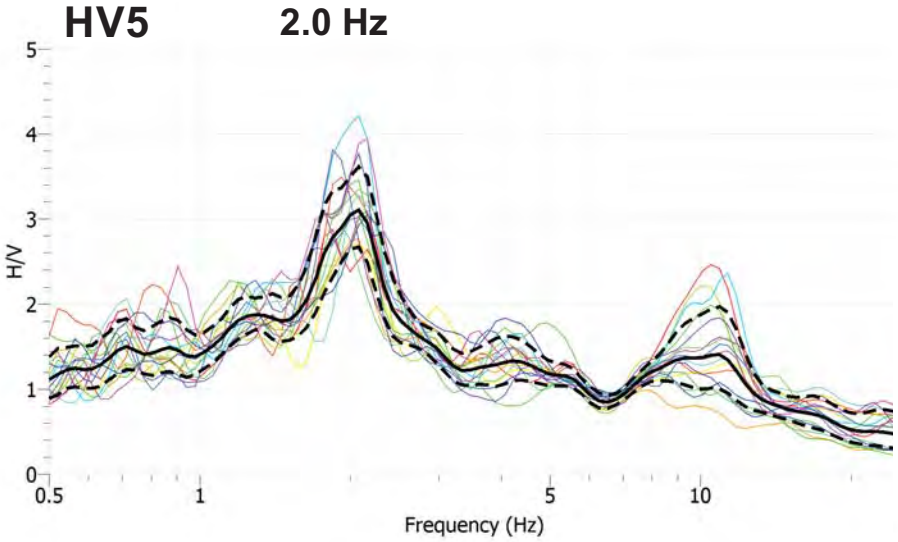

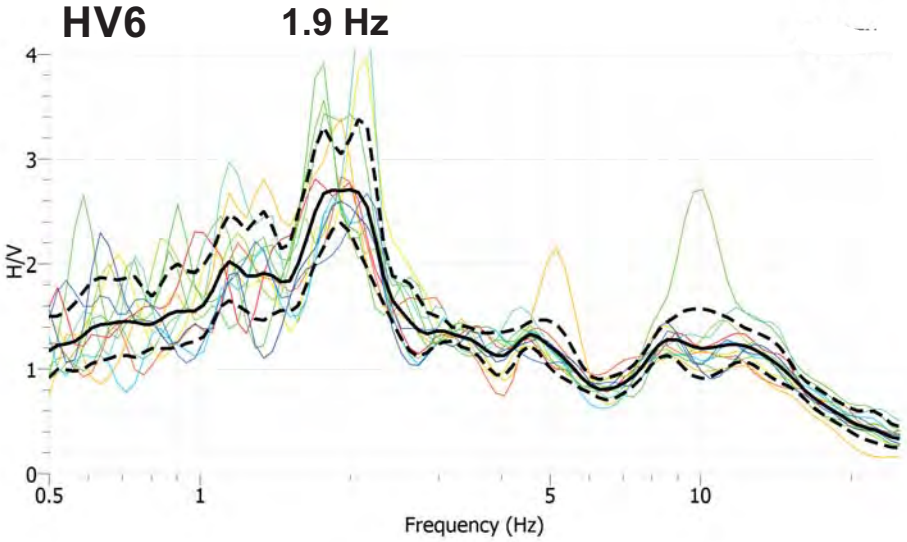

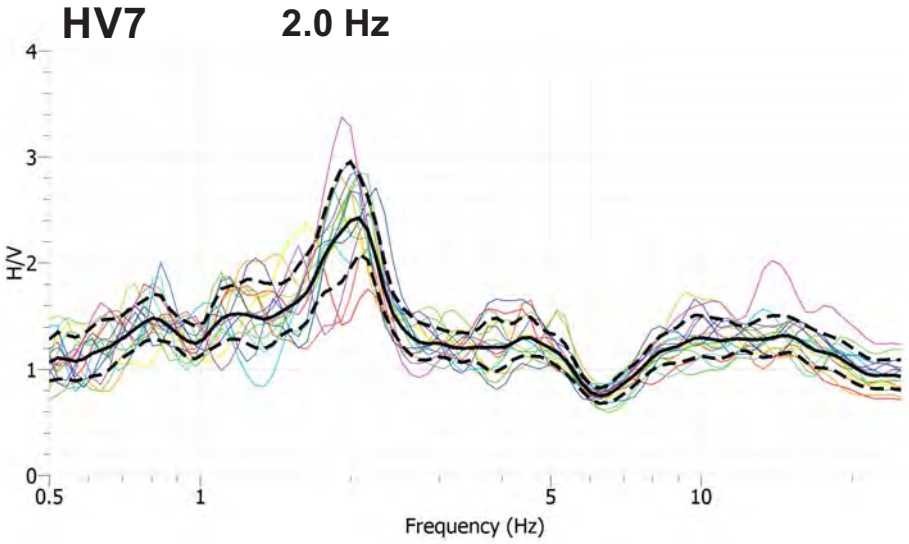

GEOVision geophysical services	Figure 8 HVSR Data - Stations HV5 to HV7
Project No.: 18113	Site Located at MTA Potrero Facility San Francisco, California
Date: May 1, 2018	
Drawn By:D. Carpenter	
Approved By: A. Martin	Prepared for Arup, Inc.
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APPENDIX A

ACTIVE AND PASSIVE SURFACE WAVE TECHNIQUES

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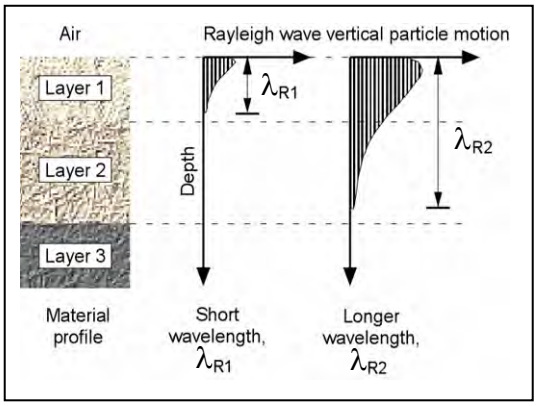
Overview

Active and passive surface wave techniques are relatively new in-situ seismic methods for determining shear wave velocity (V_S) profiles. Testing is performed on the ground surface, allowing for less costly measurements than with traditional borehole methods. The basis of surface wave techniques is the dispersive characteristic of Rayleigh waves when traveling through a layered medium. Rayleigh wave velocity is determined by the material properties (primarily shear wave velocity, but also to a lesser degree compression wave velocity and material density) of the subsurface to a depth of approximately 1 to 2 wavelengths. As shown in the adjacent diagram, longer wavelengths penetrate deeper and their velocity is affected by the material properties at greater depth. Surface wave testing consists of measuring the surface wave dispersion curve at a site and modeling it to obtain the corresponding shear wave velocity profile.



Active Surface Wave Techniques

Active surface wave techniques measure surface waves generated by dynamic sources such as hammers, weight drops, electromechanical shakers, vibroseis and bulldozers. These techniques include the spectral analysis of surface waves (SASW) and multi-channel array surface wave (MASW) methods.

Hammer Energy Sources

Accelerated Weight Drop

Electromechanical Shaker

Bulldozer Energy Source

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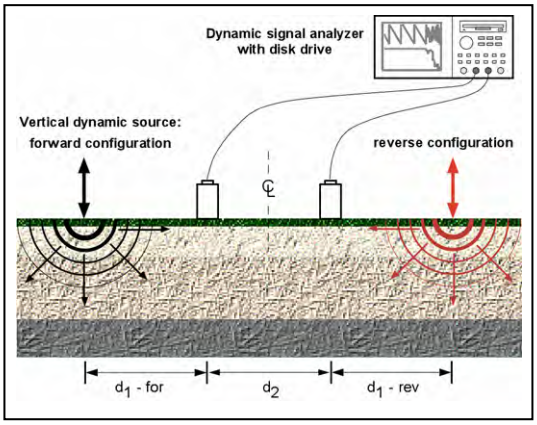
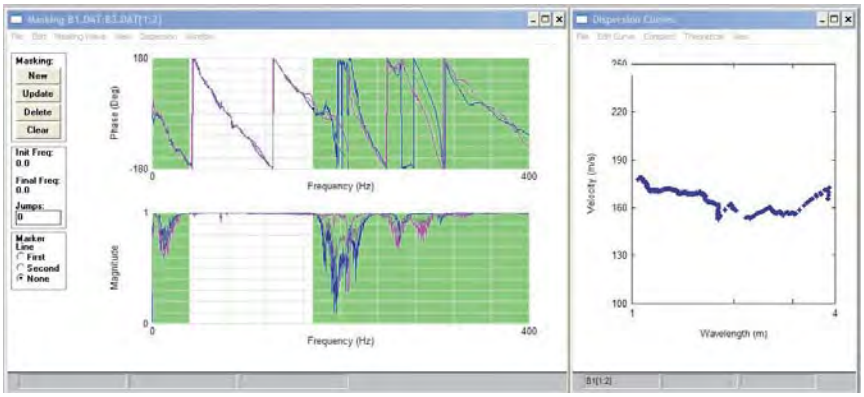
The SASW method is optimized for conducting V_S depth soundings. A dynamic source is used to generate surface waves of different wavelengths (or frequencies) which are monitored by two or more receivers at known offsets. An expanding receiver spread and optimized source-receiver geometry are used to minimize near field effects, body wave signal and attenuation. A dynamic signal analyzer is typically used to calculate the phase and coherence of the cross spectrum of the time history data collected at a pair of receivers. During data analysis, an interactive masking process is used to discard low quality data and to unwrap the phase spectrum, as shown in the figure below. The dispersion curve (Rayleigh wave phase velocity versus frequency or alternatively wavelength) is calculated from the unwrapped phase spectrum.



SASW Setup

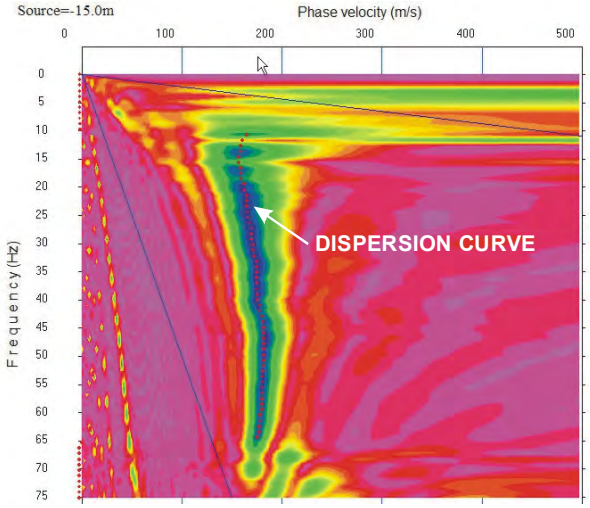
HP Dynamic Signal Analyzer



Masking of Wrapped Phase Spectrum and Resulting Dispersion Curve

The MASW field layout is similar to that of the seismic refraction technique. Twenty four, or more, geophones are laid out in a linear array with 1 to 2m spacing and connected to a multi-channel seismograph as shown below. This technique is ideally suited to 2D V_S imaging, with data collected in a roll-along manner similar to that of the seismic reflection technique. The source is offset at a predetermined distance from the near geophone usually determined by field testing. The Rayleigh wave dispersion curve is obtained by a wavefield transformation of the seismic record such as the f-k or τ-p transforms. These transforms are very effective at isolating surface wave energy from that of body waves. The dispersion curve is picked as the peak of the surface wave energy in slowness (or velocity) – frequency space as shown. One advantage of the MASW technique is that the wavefield transformation may not only identify the fundamental mode but also higher modes of surface waves. At some sites, particularly those with large velocity inversions, higher surface wave modes may contain more energy than the fundamental mode.

MASW Field Setup



Wavefield Transform of MASW data

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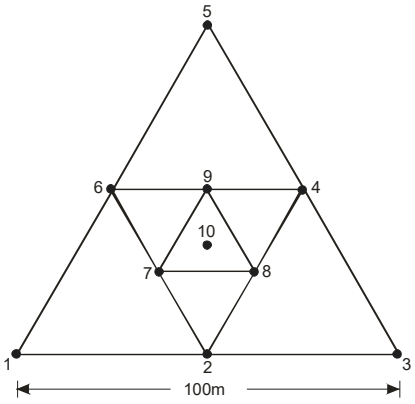
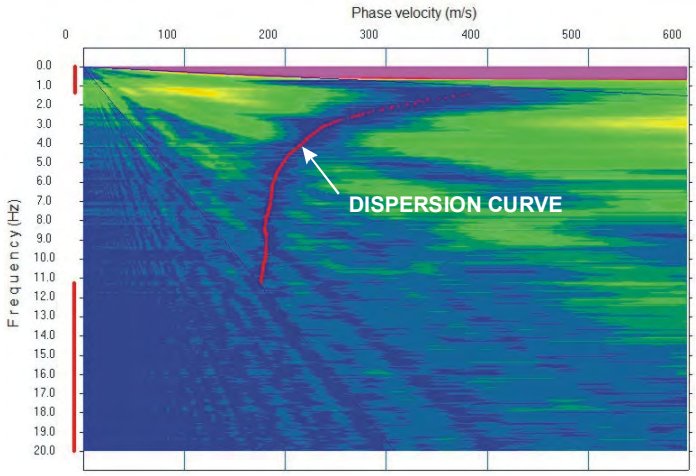
Passive Surface Wave Techniques

Passive surface wave techniques measure noise; surface waves from ocean wave activity, traffic, factories, etc. These techniques include the array microtremor and refraction microtremor (REMI) techniques.

The array microtremor technique typically uses 7 or more 4.5- or 1-Hz geophones arranged in a two-dimensional array. The most common arrays are the triangle, circle, semi-circle and "L" arrays. The triangle array, which consists of several embedded equilateral triangles, is often used as it provides good results with a relatively small number of geophones. With this array the outer side of the triangle should be at least as long as the desired depth of investigation. Typically, fifteen to twenty 30-second noise records are acquired for analysis. The spatial autocorrelation (SPAC) technique is one of several methods that can be used to estimate the Rayleigh wave dispersion curve. A first order Bessel function is fit to the SPAC function to determine the phase velocity for particular frequency. The image shown below shows the degree of fitness of the Bessel function to the SPAC function for a wide range of phase velocity and frequency. The dispersion curve, is the peak (best fit), as shown in the figure below.



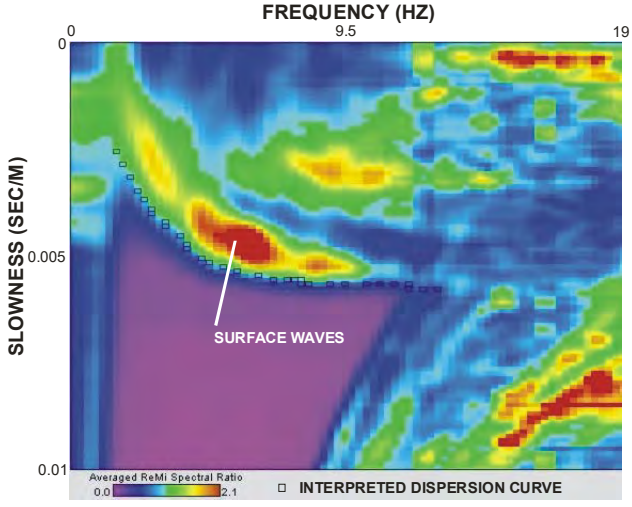
Triangle Array Geometry



Dispersion Curve from Array Microtremor Measurements

The refraction microtremor (REMI) technique uses a field layout similar to the seismic refraction method (hence its name). Twenty-four, 4.5 Hz geophones are laid out in a linear array with a spacing of 6 to 8m and fifteen to twenty 30-second noise records are acquired. A slowness-frequency (p-f) wavefield transform is used to separate Rayleigh wave energy from that of other waves. Because the noise field can originate from any direction, the wavefield transform is conducted for multiple vectors through the geophone array, all of which are summed. The dispersion curve is defined as the lower envelope of the Rayleigh wave energy in p-f space. Because the lower envelope is picked rather than the energy peak (energy traveling along the profile is slower than that approaching from an angle), this technique may be somewhat more subjective than the others, particularly at low frequencies. The SPAC technique can also be used to extract the surface wave dispersion curve from linear array microtremor data providing there are omni-directional noise sources.

Refraction Microtremor Array Layout



Wavefield Transform of REMI Data

Depth of Investigation

Active surface wave investigations typically use various sized sledge hammers to image the shear wave velocity structure to depths of up to 15m. Weight drops and electromechanical shakers can often be used to image to depths of 30m. Bulldozers and vibroseis trucks can be used to image to depths as great as 100m. Passive surface wave techniques can often image shear wave velocity structure to depths of over 100m, given sufficient noise sources and space for the receiver array. Large passive arrays, utilizing long-period seismometers with GPS clocks have been used to image shear wave velocity structure to depths of several kilometers.

Combined Active and Passive Surface Wave Testing

The combined use of active and passive techniques may offer significant advantages on many investigations. It can be very costly to mobilize large energy sources for 30m/100ft active surface wave soundings. In urban environments, the combined use of active and passive surface wave techniques can image to these depths without the need for large energy sources. We have found that dispersion curves from active and passive surface wave techniques are generally in good agreement, making the combined use of the two techniques viable. It is not recommended that passive surface wave techniques be applied alone for UBC/IBC site classification investigations. Microtremor techniques do not generally characterize near surface velocity, which may have a significant impact of the average shear wave velocity of the upper 30m or 100ft and so should always be used in conjunction with SASW or MASW. An SASW sounding to a depth of 30m requires at least a 60m linear array. If sufficient space is not available for this, it may be possible to use a 45m triangle array on the site or place a 100-200m long REMI array along an adjacent sidewalk or an "L" array at an adjacent street intersection.

Microtremor Measurements along Sidewalk

Modeling

There are several options for interpreting surface wave dispersion curves, depending on the accuracy required in the shear wave velocity profile. A simple empirical analysis can be done to estimate the average shear wave velocity profile. For greater accuracy, forward modeling of fundamental-mode Rayleigh wave dispersion as well as full stress wave propagation can be performed using several software packages. A formal inversion scheme may also be used. With many of the analytical approaches, background information on the site can be incorporated into the model and the resolution of the final profile may be quantified.

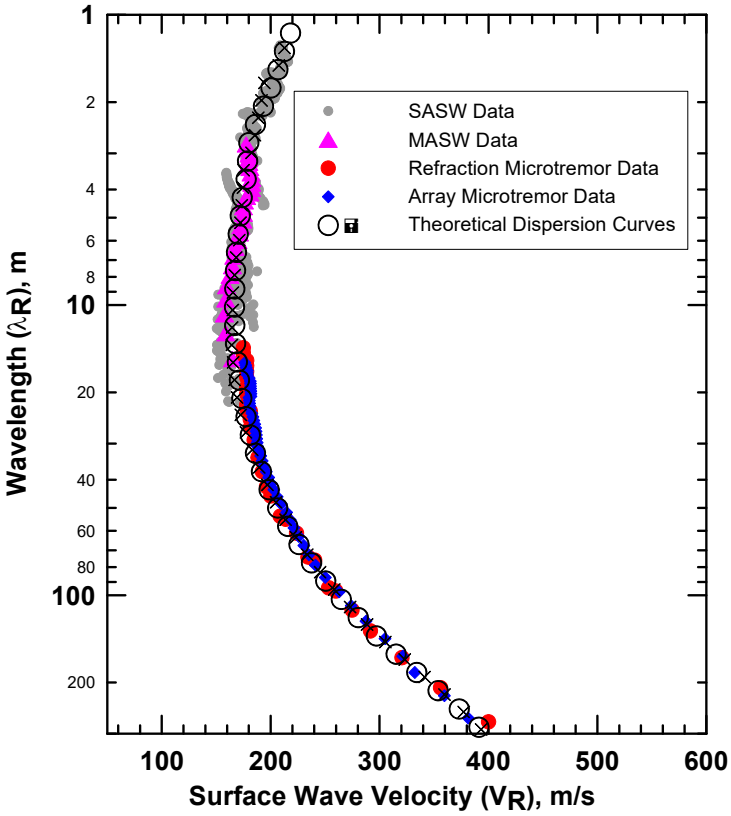
Applications

Active and passive surface wave testing can be used to obtain V_S profiles for:

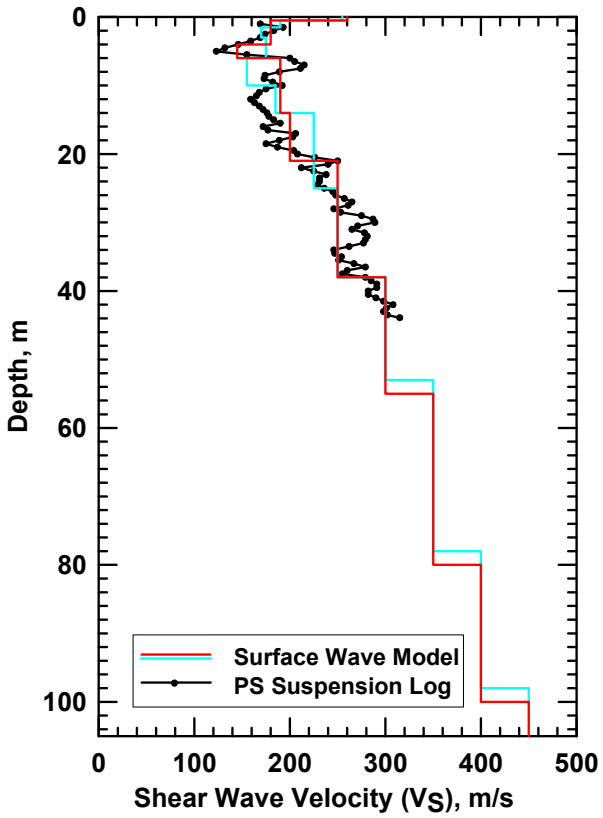
- UBC/IBC site classification for seismic design
- Earthquake site response
- Seismic microzonation
- Liquefaction analysis
- Soil compaction control
- Mapping subsurface stratigraphy
- Locating potentially weak zones in earthen embankments and levees

Case History

The figures below show the surface wave dispersion curves and alternative shear wave velocity models for a site in Los Angeles, California. All of the previous figures illustrating SASW, MASW, array and refraction microtremor techniques were from this site. The dispersion curves from all four methods are shown on the left along with the theoretical dispersion curves for alternative S-wave velocity versus depth models on the right. Conditions at this site were very poor for active surface wave techniques because of the presence of very low velocity hydraulic fill. In fact, with active surface wave techniques it was only possible to image to a depth of about 12.5m with energy sources typically capable of imaging to 30m. There is excellent agreement in the dispersion curves generated from all of the methods over the overlapping wavelength ranges. The minor differences probably result from variable velocity of the hydraulic fill within the sampling volume of the specific methods. Two Vs versus depth models were generated to illustrate the difficulty modeling the highly variable, near surface velocity structure evident in the PS log. The two surface wave models yielded similar values for the average shear-wave velocity of the upper 30m (V_S30), 201 and 202 m/s, illustrating that Vs30 is much more tightly constrained than the actual layer thicknesses and velocities in the models. V_S30 estimated from the PS log (194 m/s) is within 4% of that estimated from the two surface wave models (201 and 202 m/s). The small differences in V_S30 between the two methods may easily result from the different sampling regimes (borehole versus large area) rather than errors in either of the methods.



Field Data and Theoretical Dispersion Curve



VS Model

In contrast to borehole measurements which are point estimates, surface wave testing is a global measurement, that is, a much larger volume of the subsurface is sampled. The resulting profile is representative of the subsurface properties averaged over distances of up to several hundred feet. Although surface wave techniques do not have the layer sensitivity or accuracy (velocity and layer thickness) of borehole techniques; the average velocity over a large depth interval (i.e. the average shear wave velocity of the upper 30m or 100ft) is very well constrained. Because surface wave methods are non-invasive and non-destructive, it is relatively easy to obtain the necessary permits for testing. At sites that are favorable for surface wave propagation, active and passive surface wave techniques allow appreciable cost and time savings.

HVSR METHOD

HORIZONTAL/VERTICAL SPECTRAL RATIO (HVSR) METHOD

Overview

The HVSR method is a single station passive seismic method for estimating the fundamental site period (frequency), which is related to the thickness and average shear (S) wave velocity of the sediments overlying bedrock. It should be noted that the HVSR frequency peak is typically very close to, but not always identical to, the fundamental site frequency. Passive seismic techniques involve the recording of ambient noise emanating from ocean wave activity, atmospheric conditions, wind effects, traffic, industrial activity, construction activities, etc., and collectively are referred to as microseisms. Typically, microseisms with frequencies below 1 Hz have natural origins, whereas those with frequencies above 1 Hz are largely due to human activities. The HVSR technique is most often utilized as part of seismic microzonation studies of sedimentary basin, but is recently finding use in hydrogeologic studies to identify potential drill sites with bedrock at the greatest depth.

Tromino ENGR used for HVSR measurements in shallow basins

Procedure

The HVSR method uses a 3-component seismometer to record ambient noise for a period of time between 15 minutes and several hours depending on the estimated thickness of the sediments and ambient noise conditions. The ratio of the Fourier amplitude spectra of the horizontal and vertical components is calculated to determine the frequency of the maximum HVSR response, commonly accepted as an approximation of the fundamental frequency (f_0) of the sediment column overlying bedrock.

There are several options for interpreting HVSR data, depending upon the objectives of the investigation, including: joint inversion of the HVSR curve or peak frequency with surface wave dispersion curves, quarter-wavelength correlation, or simple empirical analysis using HVSR data collected at locations with known bedrock depth.

Trillium Compact 120 second seismometer used for HVSR measurements in deep basins

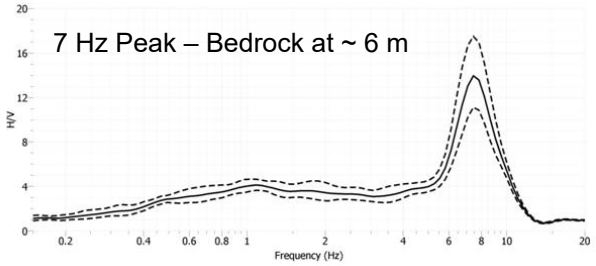
The quarter-wavelength approximation is:

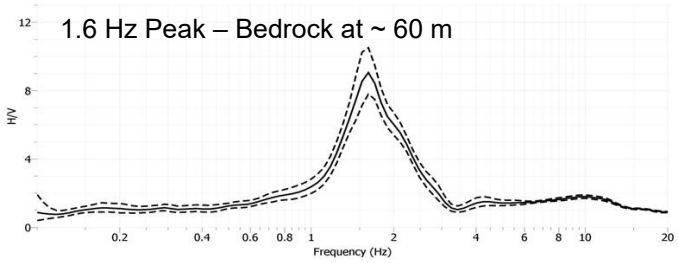
$$f_0 = \frac{\overline{V}_S}{4z}$$

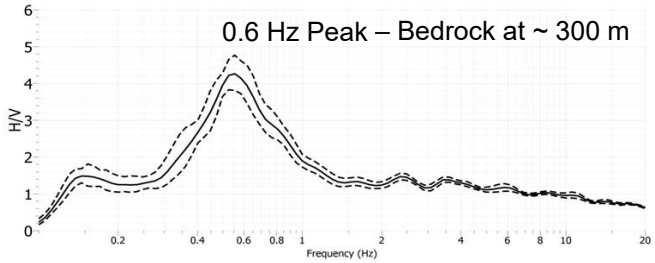
where f_0 is the site fundamental frequency, $\overline{V}_S$ is the average shear-wave velocity of the soil column overlying bedrock at depth *z*. *This relationship* can be used to estimate the average shear wave velocity profile of the sediments when depth to bedrock is known or vice versa. As evident in this relationship, the fundamental site frequency is inversely proportional to bedrock depth; therefore, shallow bedrock will be associated with a high frequency peak and vice versa. If active and passive surface wave soundings are conducted in the deeper portion of sedimentary basins, it may be possible to develop an average S-wave velocity versus depth profile for the basin and use this along with the HVSR frequency peak to estimate bedrock depth. Alternatively, HVSR measurements can be made at locations with known depth to bedrock and a correlation between HVSR peak frequency and bedrock depth developed.

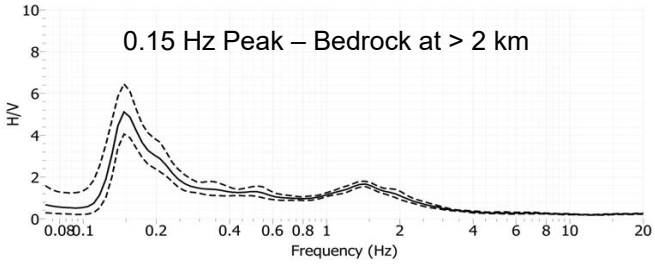
1124 Olympic Drive, Corona, California 92881, ph. 951-549-1234, fx. 951-549-1236
www.geovision.com

The figures below show HVSR data collected at sites with different approximate basement depths. Sites with shallow rock will have HVSR peaks at several Hz, while deep sedimentary basins will have HVSR peaks at a fraction of a hertz.

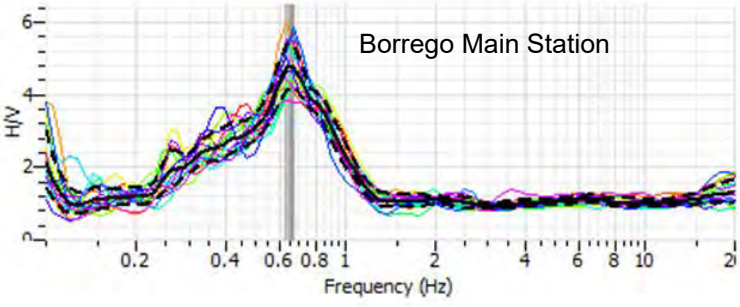


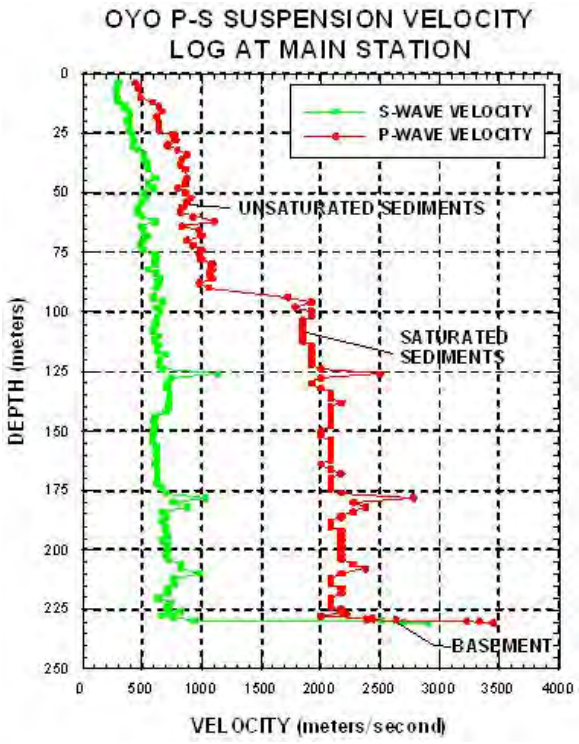






The figures below demonstrate the effectiveness of the quarter-wavelength approximation. At this site near Borrego Springs, California, a PS Suspension log was acquired in a borehole that encountered bedrock at a depth of 229 m. The PS Suspension log indicates that the average S-wave velocity of the sediments overlying bedrock is about 572 m/s. The HVSR peak at this site is 0.65 Hz which, combined with the average velocity of the sediments, indicates that bedrock is about 220 m deep, within 4% of that encountered in the borehole.





HVSR testing can be used for:

- Seismic microzonation studies.
- Confirming that the velocity structure is 1-D beneath large active/passive surface wave arrays.
- Reduce non-uniqueness in S-wave velocity models developed from surface wave testing through joint inversion.
- Estimate relative depth to bedrock for hydrogeologic studies.

APPENDIX E

MASW GEOPHYSICAL SURVEY INVESTIGATION REPORT (NORCAL GEOPHYSICAL CONSULTANTS, INC.)

Geophysical Report

Geophysical Investigation:
SFMTA Potrero Facility Rebuild
South San Francisco, California

April 28, 2023
NORCAL JOB NO. NS225145

Prepared for:

LANGAN

Prepared by:

NORCAL GEOPHYSICAL CONSULTANTS INC.
A Terracon COMPANY

NORCAL Geophysical Consultants, Inc. 321A Blodgett Street Cotati, California 94931
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NORCAL GEOPHYSICAL CONSULTANTS INC.
A terracon COMPANY

April 28, 2023

Langan Engineering and Environmental Services, Inc.
3320 Data Drive, Suite 350
Rancho Cordova, California 95680-7352

Subject: Geophysical Investigation:
SFMTA Potrero Facility Rebuild
San Francisco, California
NORCAL Project No. NS225145

Attention: Ms. Jenna Fontaine

Dear Ms. Fontaine,

This report presents the findings of a geophysical investigation performed by NORCAL Geophysical Consultants, Inc., a Terracon company (NORCAL), for Langan Engineering and Environmental Services, Inc. (Langan). The investigation was performed for the SFMTA Potrero Facility Rebuild project located along Hampshire Street between 17th and Mariposa Streets in San Francisco, California. The investigation consisted of the seismic refraction (SR) & multichannel analysis of surface waves (MASW) geophysical methods.

This geophysical investigation is supplemental to a geotechnical investigation currently underway by Langan. The work was authorized under a Langan Subcontractor Authorization for Langan Project No. 770691710 dated March 31, 2023. NORCAL Professional Geophysicist David T. Hagin (CA PGp No. 1033) and Staff Geophysicist Matthew N. LaRiviere conducted the survey on March 30, 2023.

The scope of NORCAL's services for this project consisted of using geophysical methods to characterize the subsurface. The accuracy of our findings is subject to specific site conditions and limitations inherent to the techniques used. We performed our services in a manner consistent with the standard of care ordinarily exercised by members of the profession currently employing similar methods. No warranty, with respect to the performance of services or products delivered under this agreement, express or implied, is made by NORCAL.

NORCAL
GEOPHYSICAL CONSULTANTS INC.
A Tierracon COMPANY

We appreciate having the opportunity to provide our services for this project. If you have any questions or require additional geophysical services, please do not hesitate to call on us.

Sincerely,
NORCAL Geophysical Consultants, Inc.

David T. Hagin
California Professional Geophysicist
PGp 1033

PROFESSIONAL GEOPHYSICIST
DAVID T HAGIN
No. 1033
STATE OF CALIFORNIA
4-28-2023

Donald J. Kirker, Reviewer
California Professional Geophysicist
PGp No. 997

PROFESSIONAL GEOPHYSICIST
DONALD KIRKER
No. 997
STATE OF CALIFORNIA
4-28-2023

1.0 INTRODUCTION

A rebuild is planned for the Potrero SFMTA facility in South San Francisco. "*The Potrero Yard Modernization Project will replace an obsolete, century-old bus yard with a modern, three-story, efficient bus maintenance and storage facility, equipped to serve the SFMTA's growing fleet as it transitions to battery electric buses" (sfmta.com).* A geotechnical investigation is currently underway by Langan for this project. They will use the information from this geophysical survey to aid in the planning and design for foundations and other structural elements of the planned improvements.

The geophysical investigation comprised two methods: seismic refraction (SR) and multichannel analysis of surface waves (MASW) surveys. The SR method provides p-wave velocity values that may aid in determining the consolidation, cementation, or hardness of the underlying lithologic materials. The MASW method produces s-wave velocity values that can provide information regarding the relative strength of the underlying geology, which can be used to assess the seismic site class (Vs30).

2.0 SITE CONDITIONS

The following description of site conditions is derived from our observations during the survey and a review of publicly available aerial photographs, geologic and topographic maps.

Item	Description
Site Information	The survey site is located along Hampshire Street between 17th and Mariposa Streets in San Francisco, California. The approximate geographic coordinates of the center of the site are: (37°45'49.9"N 122°24'27.0"W).
Survey Site	The seismic surveys were performed on an asphalt-covered, street-side parking area to the east of the current structure.
Existing Topography	Based on our Trimble Geo7X GPS, Google Earth and site observations, the site consists of relatively flat terrain that slopes very slightly southward. Surface elevations range from about 50- to 72-ft (NAVD88).
Site Geology	Available geologic maps (USGS OFR 2006-1037; CGS 2002, 2003) indicate that the site geology is near the mapped border of Quaternary age sand deposits to the southwest and Mesozoic ultramafic rocks to the northeast.

3.0 SCOPE OF WORK

Our scope of work included acquiring seismic data consisting of both SR to measure primary compressional-wave (p-wave), and MASW to quantify secondary shear-wave (s-wave) values. Data acquisition consisted of one SR line, designated as Line SR-1, and two MASW soundings, denoted MASW-1 and MASW-2.

Aerial photographic images showing the site vicinity and the locations of the seismic surveys are provided on **Plate 1 – Site Location Map**, as detailed in the legend. To provide documentation of our investigation, this geophysical report includes the site location map, details of our data acquisition and processing, as well as the resulting SR profile and MASW shear-wave models, presented in both tabular and graphic form.

4.0 SEISMIC REFRACTION SURVEY

4.1 SR SURVEY METHOD

The SR method is designed to measure subsurface variations in the compressional (P-) wave velocities, which will be denoted herein as "Vp." Variations in Vp can be indicative of variations in the density and elastic properties of subsurface materials. The Vp values can typically be interpreted to differentiate between bedrock and overburden, as well as to evaluate the underlying bedrock. The SR method provides both vertical and lateral variations in the Vp of subsurface materials. These measurements can then be used to produce a two-dimensional (2D) cross-section (profile) illustrating variations in Vp versus depth and distance beneath the seismic line.

Typically, Vp is dependent on physical properties such as density, hardness, compaction, and induration. However, other factors such as bedding, fracturing and saturation also affect Vp. In general, the Vp of weathered rock and consolidated or cemented sedimentary deposits are higher than those of unconsolidated sediments or fill material. Within rock, higher Vp values typically correspond with harder, less weathered and/or fractured rock. Therefore, the configuration of Vp values may aid in determining the thickness of sedimentary and soil layers (overburden), and the character of the underlying bedrock.

Detailed descriptions of the SR methodology, the instrumentation we used, our data acquisition, analysis and interpretation procedures as well as the general limitations of the method are provided in **Appendix A – Seismic Refraction Survey**.

4.2 SR PROFILE

The results of the SR survey are illustrated by the color contoured seismic velocity cross-section (profile) shown on **Plate 2 – Seismic Refraction Profile**. The vertical axis represents elevation (NAVD88), and the horizontal axis represents the survey stationing established for the SR line, with the zero-value at the northwestern end of the line. The unit of measure for both axes is the US Survey Foot. The solid black line along the top of the contoured portion of the profile represents the ground surface. The maximum depth of investigation is determined by the greatest shot-to-receiver distance and is estimated to be 50-ft below ground surface.

4.3 SEISMIC P-WAVE VELOCITY VALUES

Seismic p-wave velocity (Vp) is represented by the labeled contours and the color shading between contours and is presented in feet per second (ft/sec). The relationship between color and Vp is specified by the color scale shown below each profile. The color scales are identical (normalized) for ease of comparison.

The Vp measured by the seismic refraction survey range from slightly less than 1,000 ft/sec near the surface to greater than 10,000 ft/sec at depth. This velocity range can be differentiated into three sub-ranges which we define herein as low, moderate and high.

- *Low Vp* range from approximately 1,000 to 4,500 ft/sec and are represented by tan to yellow shading. Vp in this range typically represent unsaturated surficial soils, poorly consolidated sedimentary deposits or fill.

- *Moderate Vp* range from 4,500 to 6,500 ft/sec and are represented by shades of green to blue. Vp in this range typically represent more consolidated, cemented or saturated sediments and/or weathered rock.

- *High Vp* range from 6,500 to over 10,000 ft/sec and are represented by varying shades of maroon, typically representing rock with varying degrees of weathering. As Vp increases, weathering and/or fracturing typically decrease.

4.4 OBSERVATIONS

The distribution of Vp values allows for a general interpretation of thickness of soils and sediments and depth-to-rock, drawn from the Vp interpretations presented in Section 4.3.

- The profile for Line SR-1 shows high Vp (maroon) across the bottom of the profile, dropping in elevation toward the southwest, likely indicating the presence of hard rock. The high Vp are near 20-ft deep at the northwest end of the profile and drop to about 45-ft at the southwest end.

- Moderate Vp values (blue, green) are moderately thin on the northern end of the profile and thicken considerably toward the south, varying from about 15- to 30-ft thick. These values may represent the dune sands overlying the ultramafic rock. The sands are mapped toward the southwest, as indicated on the geologic map (CGS 2002, 2003).

- The upper portion of the profile shows 5- to 10-ft of surficial low Vp (tan, yellow), likely representing a layer of soils and/or poorly consolidated sedimentary deposits.

5.0 MASW SURVEY

5.1 MASW SURVEY METHOD

The Seismic Multichannel Analysis of Surface Waves (MASW) sounding survey measures the shear-wave (Vs) velocities of the subsurface as a function of depth. The method used for this survey is referred to as a sounding, producing one-dimensional (1D) data that are presented in both tabular and graphic form as a layered shear wave model. The location of each sounding is the center of the geophone array. Descriptions of the MASW methodology, our data acquisition and analysis procedures, and the instrumentation we employed are provided in **Appendix B – MASW Sounding Survey**.

The standard method of reporting MASW data is to consider the location of the 1D velocity vs. depth model as the center point of the MASW array. However, this does not mean that the measured velocity values represent materials solely beneath that location. In fact, the subsurface conditions underlying the entire length of the array, and for several tens of feet to either side, contribute to the measured velocity values.

5.2 MASW TABLES AND STEP-CHART GRAPHS

The results of the MASW survey are listed in the tables presented in Section 5.3. The left columns of each table contain the depth ranges for each layer (feet below ground surface) and the right columns comprise the associated Vs values in feet per second (ft/sec). The results are also presented graphically in ft/sec by the step charts shown on **Plates 3 and 4 – MASW Soundings**.

The maximum depth of investigation is determined by the longest wavelength (lowest frequency) measured by the survey, which is a function of the site geology, the geophone spacing and the array length. The maximum depth of exploration for each sounding is approximated as 100-ft below ground surface. Note that although Vs generally increase with depth, both data sets indicate velocity inversions (lower Vs beneath higher Vs).

5.3 SEISMIC S-WAVE VELOCITY VALUES

The s-wave layered models for MASW-1 and MASW-2 are presented by the following tables:

MASW-1: Seismic S-Wave Velocity vs Depth

DEPTH RANGE (FT)	S-WAVE VELOCITY (FT/SEC)
0 - 3	2,380
3 - 7	2,680
7 - 12	2,940
12 - 18	2,210
18 - 26	1,240
26 - 36	2,080
36 - 48	3,910
48 - 64	4,200
64 - 83	2,060
83 - 100	3,690

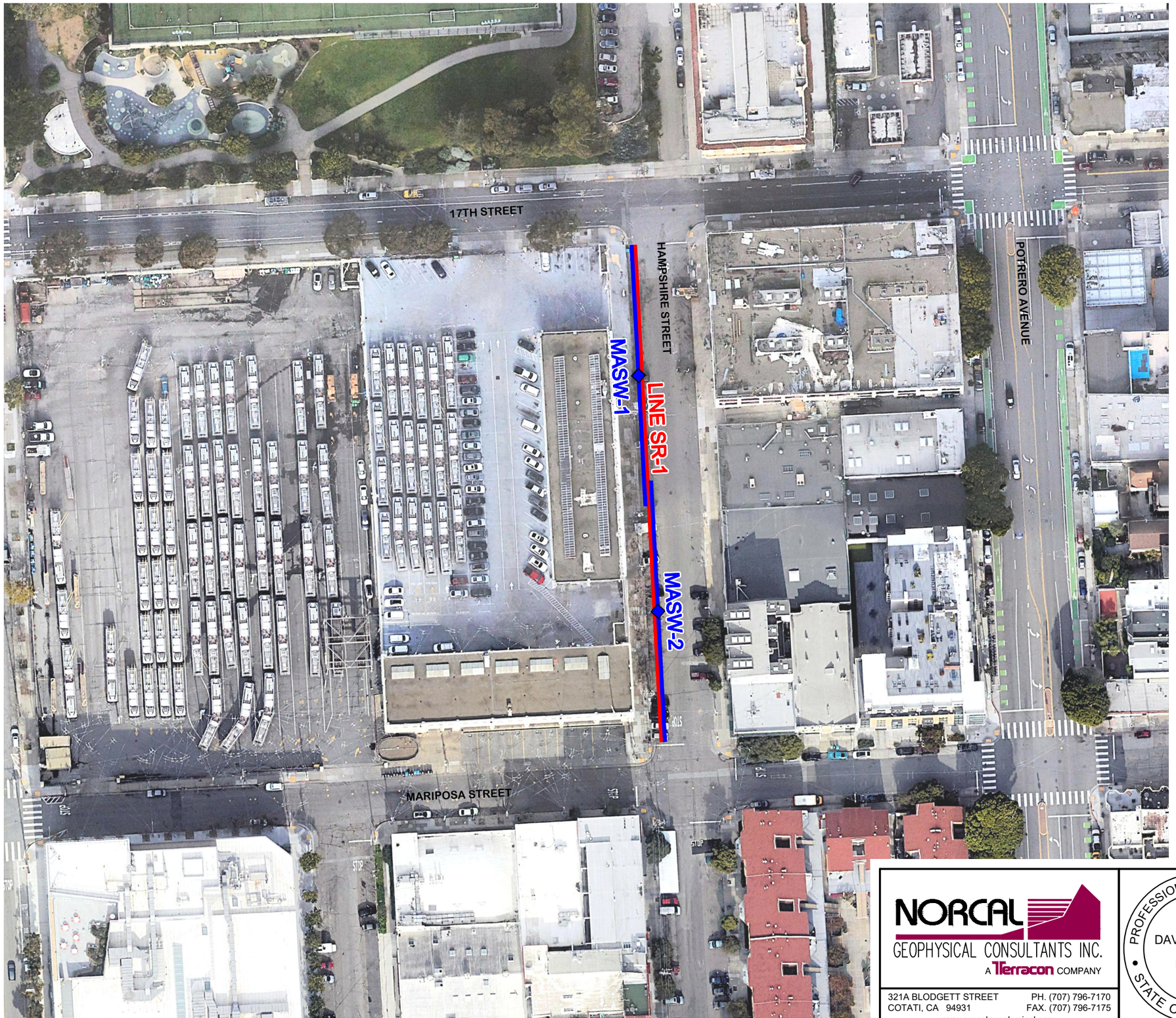
MASW-2: Seismic S-Wave Velocity vs Depth

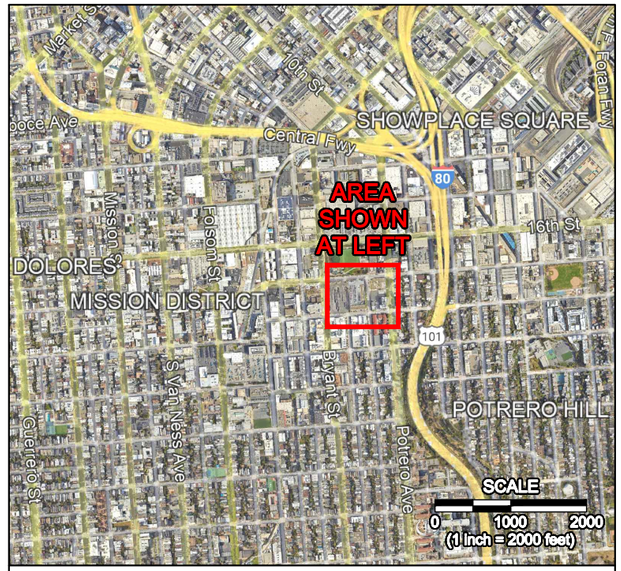
DEPTH RANGE (FT)	S-WAVE VELOCITY (FT/SEC)
0 - 2	1,910
2 - 6	2,050
6 - 9	2,140
9 - 14	2,100
14 - 20	1,790
20 - 28	1,320
28 - 37	1,600
37 - 49	2,900
49 - 63	3,720
63 - 100	5,360

The measured Vs values for both soundings range from a low of 1,240 ft/sec to a maximum of 5,360 ft/sec. It is possible that some of the measured shallow layer velocities may be increased due to the proximity of building foundations or other man-made structures.

6.0 DISCUSSION

The SR profile appears to generally agree with the general geology (USGS), as the interpreted rock appears to decrease in depth towards the north where ultramafic rock is mapped. The SR and MASW data sets show good correlation to one another within the range defined on the SR profile.





VICINITY MAP

SCALE
0 40 80 160
(1 inch = 80 feet)

LEGEND

	SEISMIC REFRACTION LINE
	MASW SOUNDING LOCATION
	MASW SOUNDING ARRAY

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PROFESSIONAL GEOPHYSICIST
DAVID T HAGIN
No. 1033
STATE OF CALIFORNIA

SITE LOCATION MAP
SEISMIC INVESTIGATION
SFMTA POTRERO FACILITY REBUILD

LOCATION: HAMPSHIRE STREET, SAN FRANCISCO, CALIFORNIA

CLIENT: LANGAN

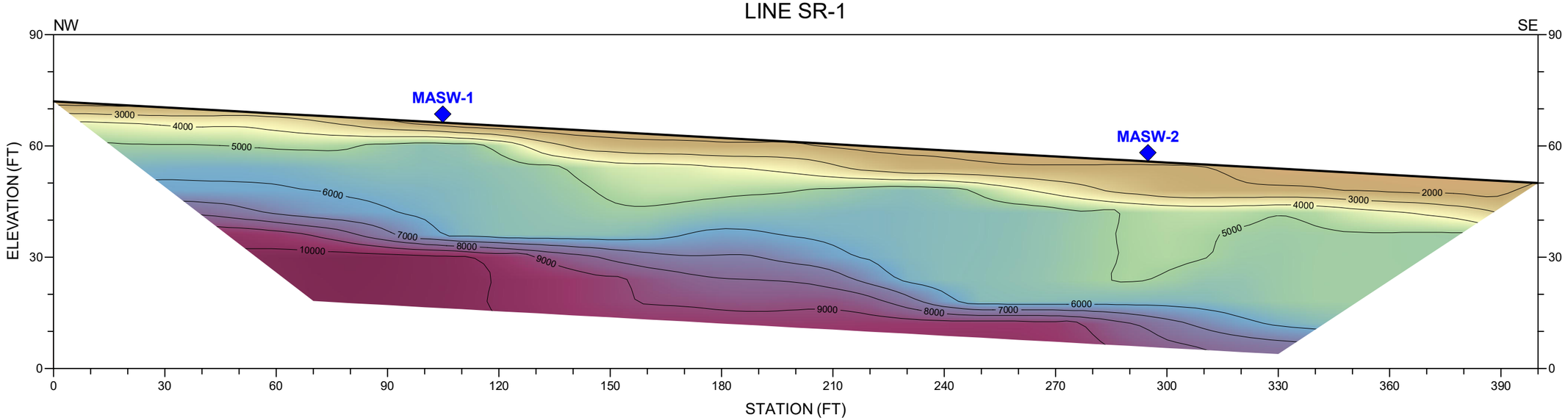
JOB #. NS225145 | DATE: APRIL 2023

DRAWN BY: H.PHILSON | APPROVED BY: DTH

David Hagin 4/27/2023

PLATE 1

LINE SR-1



SEISMIC P-WAVE VELOCITY (FT/SEC)

1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

LEGEND	
◆	MASW SOUNDING LOCATION

SCALE

0 30 60

(1 inch = 30 feet)

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SEISMIC REFRACTION PROFILE
LINE SR-1
SFMTA POTRERO FACILITY REBUILD

LOCATION: HAMPSHIRE STREET, SAN FRANCISCO, CALIFORNIA

CLIENT: LANGAN

JOB #: NS225145	DATE: APRIL 2023	PLATE 2
DRAWN BY: H.PHILSON	APPROVED BY: DTH	

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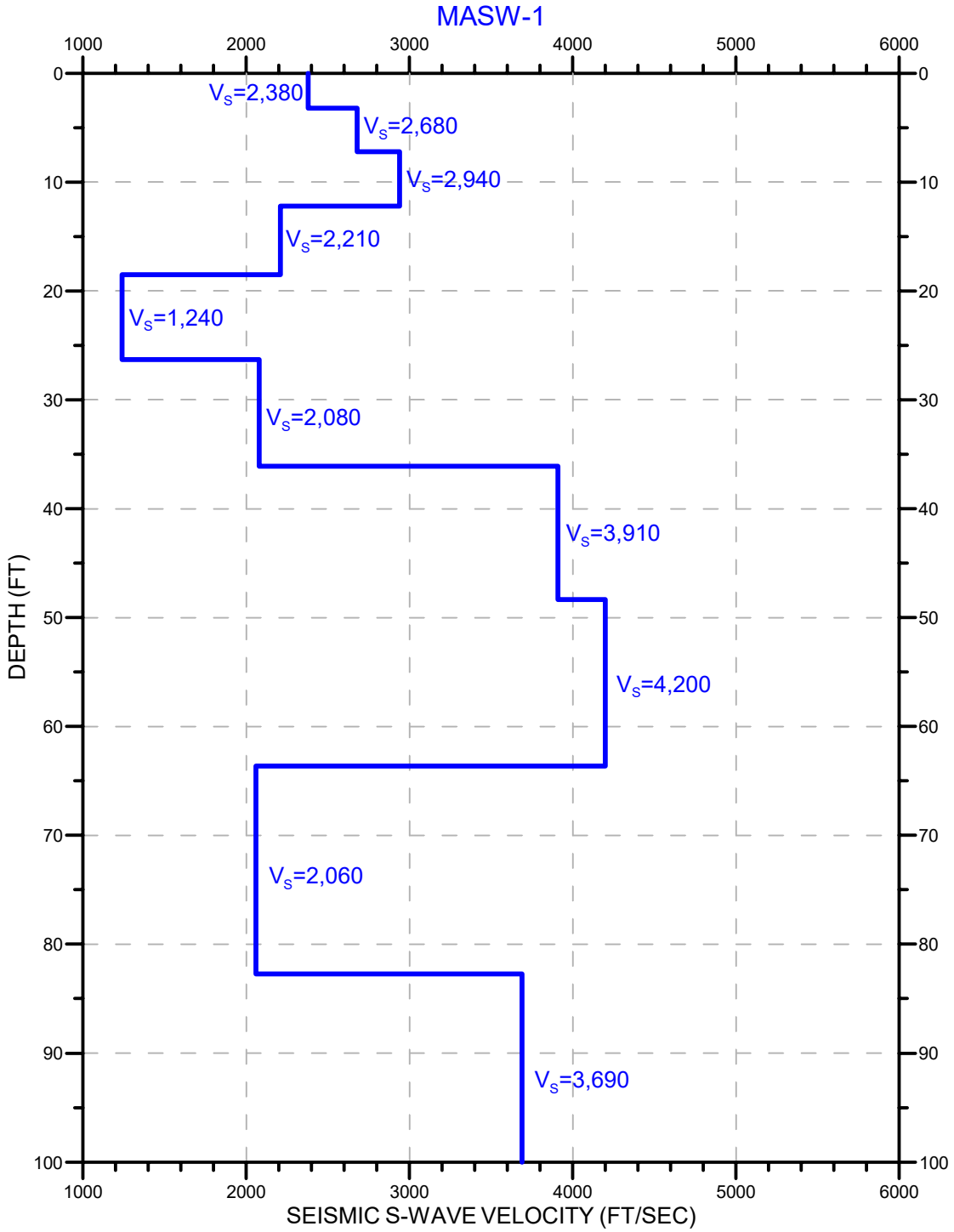

LEGEND

———	SEISMIC S-WAVE VELOCITY

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MASW SOUNDING
MASW-1
SFMTA POTRERO FACILITY REBUILD

LOCATION: HAMPSHIRE STREET, SAN FRANCISCO, CALIFORNIA

CLIENT: LANGAN

JOB #: NS225145	DATE: APRIL 2023	PLATE 3
DRAWN BY: H.PHILSON	APPROVED BY: DTH	

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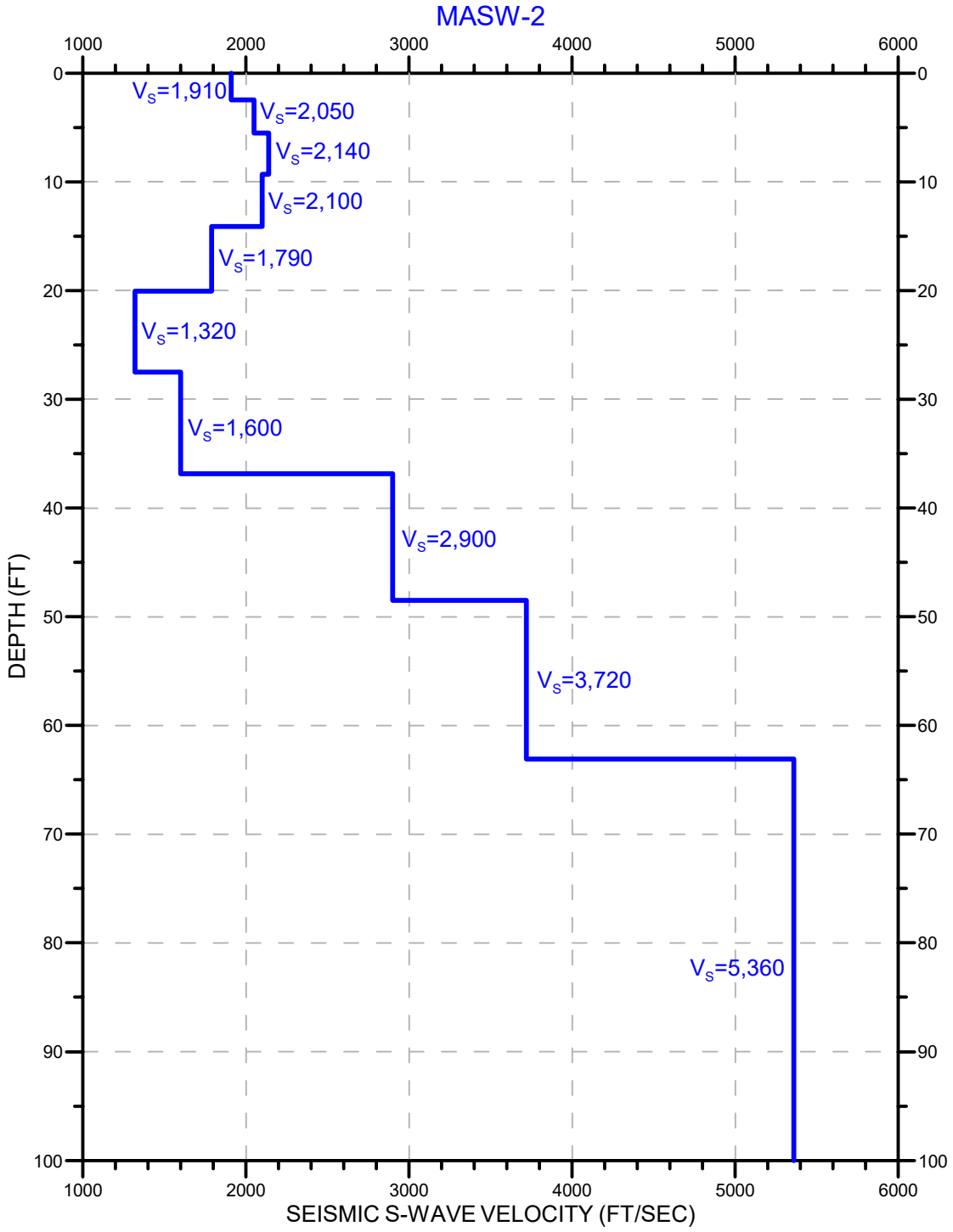

LEGEND

———	SEISMIC S-WAVE VELOCITY

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MASW SOUNDING
MASW-2
SFMTA POTRERO FACILITY REBUILD

LOCATION: HAMPSHIRE STREET, SAN FRANCISCO, CALIFORNIA

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JOB #: NS225145	DATE: APRIL 2023	PLATE 4
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David Hagin 4/27/2023

APPENDIX A:

Seismic Refraction Survey

APPENDIX A:
Seismic Refraction Survey

1.0 METHODOLOGY

The seismic refraction method provides information regarding the seismic velocity structure of the subsurface. An impulsive (mechanical or explosive) energy source is used to produce compressional (p-) wave seismic energy at the surface. The p-waves propagate into the earth and are refracted along interfaces caused by an increase in velocity. A portion of the p-wave energy is typically refracted back to the surface where it is detected by sensors (geophones) that are coupled to the ground surface in a collinear array (spread). The detected signals are recorded on a multi-channel seismograph and are analyzed to determine the shot point-to-geophone travel times. These data can be used along with the corresponding shot point-to-geophone distances and elevation data to determine the depth, thickness, and velocity of subsurface seismic layers.

2.0 INSTRUMENTATION

The seismic waveforms produced at each shot point were recorded using a Geometrics ***Geode*** 24-channel engineering distributed array seismograph, as pictured in Figure 1, and ***RT Clark*** geophones with a natural frequency of 4.5 Hz. The geophones were coupled to the ground surface by a metal spike affixed to the bottom of each geophone case. Seismic energy was produced at each shot point by multiple impacts with a 16-pound sledgehammer against a metal strike plate placed on the ground surface. The seismic waveforms were digitized, processed, and amplified by the Geode, transmitted via a ruggedized Ethernet cable to a field computer and algebraically summed (stacked) until sufficient signal to noise ratio was achieved. The data were displayed on the computer's LCD screen in the form of seismograms, analyzed for quality assurance and archived for subsequent processing. These images were subsequently used to determine the time required for P-waves to travel from each shot point to each geophone in the array (spread).

Figure 1: *Geometrics Geode 24-channel engineering distributed array seismograph.*

3.0 DATA ACQUISITION

We collected SR data along a single line, designated as Line SR-1, as described in the main body of the report. The line location is shown by the red line on the site location map (Plate 1). Langan personnel determined the location and orientation of the SR line. Data were acquired using arrays of 24 geophones with 10-ft spacing and 5 shot-points at approximately 60-ft intervals, as shown in Figure 2. Shot-points were placed off each end of the geophone arrays as well as distributed equally within each array, yielding a 250-ft length for each array. Two overlapping arrays were acquired to reach the 400-ft line length required. The maximum depth of investigation is determined by the greatest shot-to-receiver distance and is estimated to be 50-ft.

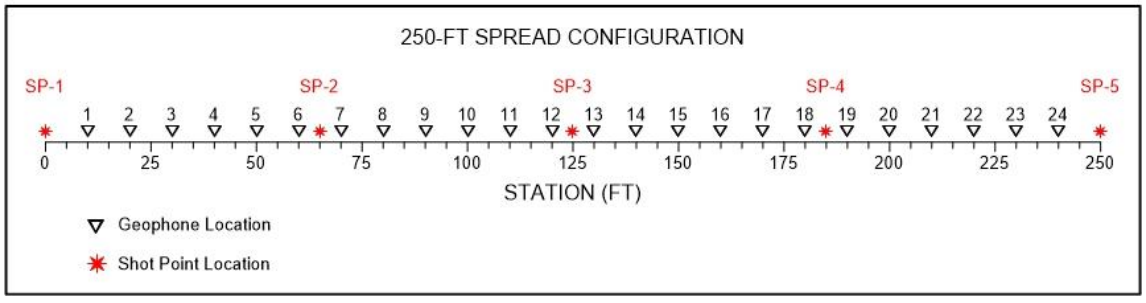


Figure 2: *SR Array configuration.*

4.0 DATA ANALYSIS

The seismic refraction data were processed using the software package ***SeisImager,*** written by Oyo Corporation (Japan) and distributed by Geometrics Inc. This package consists of two programs titled ***Pickwin,*** Version 5.1.1.2 (2013) and ***Plotrefa*****,** Version 3.0.0.6 (2014). For each seismic line we used ***Pickwin*** to view the seismic records and identify first arriving P-wave energy at each geophone and to determine the shot point to geophone travel time associated with each arrival. We then used ***Plotrefa*** to assign elevations to each geophone and to plot the shot point to geophone travel times versus their distance (Station) along the line. A sample Time versus Depth (T-D) graph is shown in Figure 3.

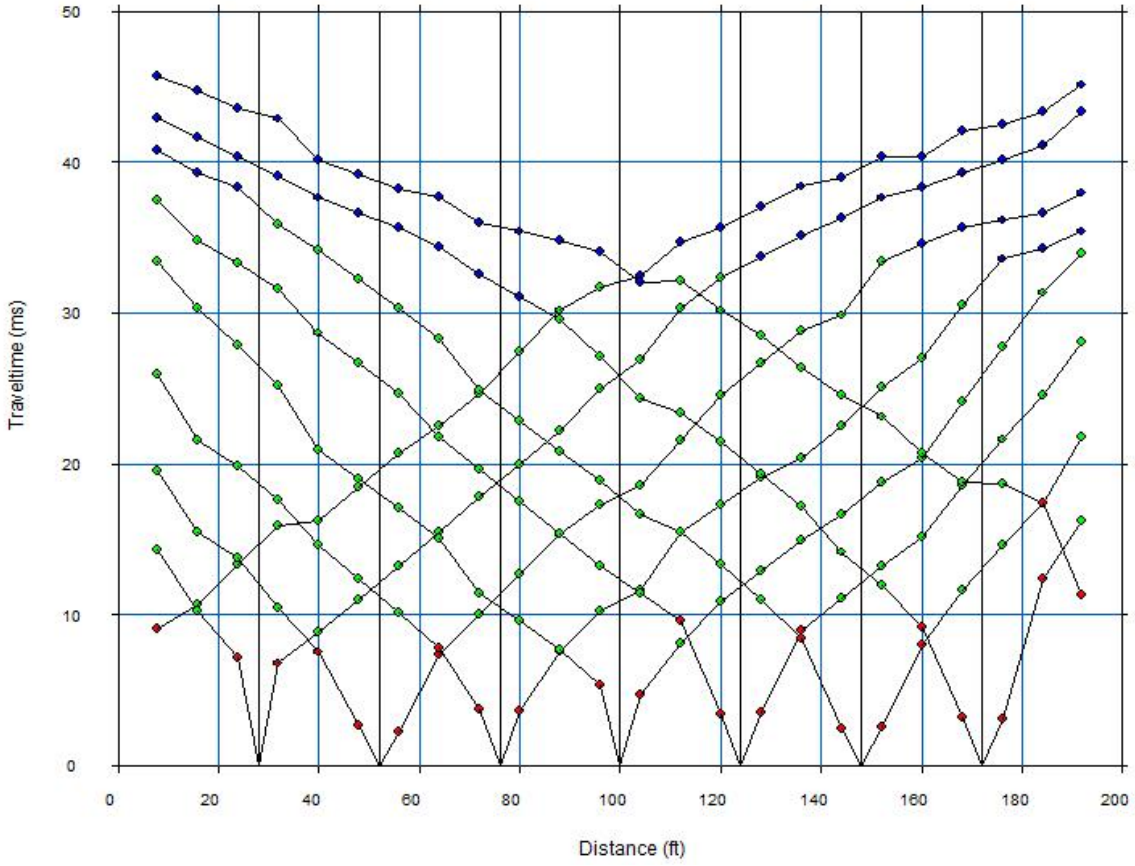


Figure 3: *Sample SR Time-Distance Graph. Red circles represent layer 1 (V1), green circles represent V2 and blue circles represent V3.*

After examining the T-D graph we assigned velocity layers (1-3) to each travel time and then computed a 2D model using ***Plotrefa's*** time-term routine. This resulted in a 2D layered cross-section (profile) illustrating seismic velocity versus depth. A sample 2D time-term model is shown in Figure 4.

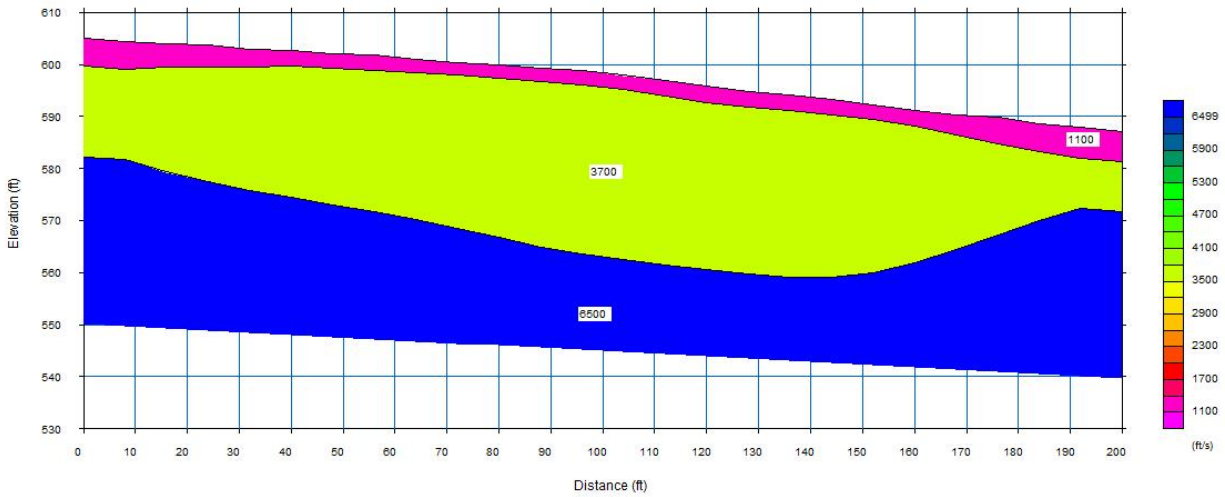


Figure 4: *Sample Time-Term Seismic Velocity Model. Velocities are labeled and indicated by the color bar on the right.*

Finally, we used the time term model as input to ***Plotrefa's*** tomographic routine. This routine divided the input model into cells according to the geophone spacing and depth range and assigned a velocity to each cell. It then used a ray-tracing routine to compute synthetic travel times through the model from each shot point to every geophone. The synthetic travel times were compared with the observed travel times to determine the goodness of fit. If the fit was not within certain assigned parameters, the program then adjusted the velocity in each cell and reran the ray tracing. This procedure was repeated through as many as 20 iterations in order to achieve the optimum fit between observed and synthetic travel times. A sample tomographic model is shown in Figure 5.

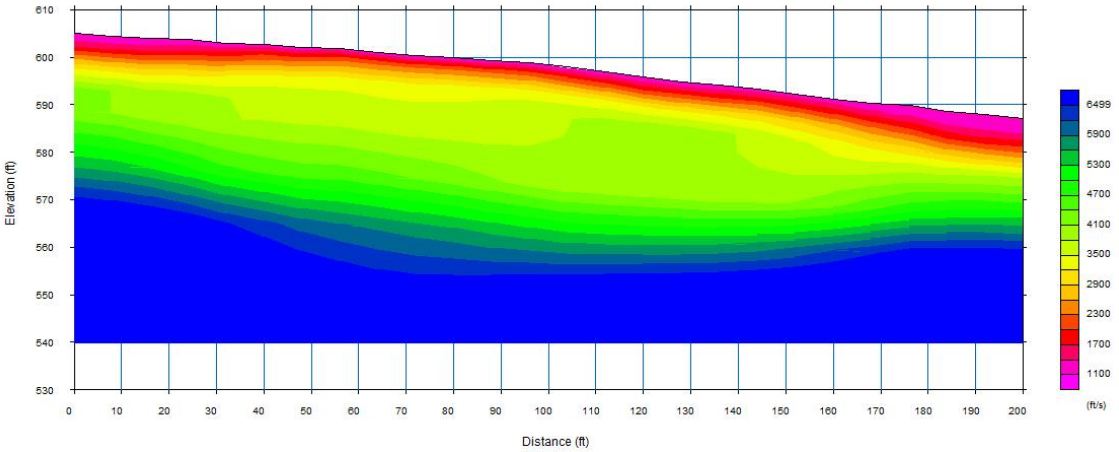


Figure 5: *Sample tomographic Inverted Seismic Velocity Model. Velocities indicated by color bar on right.*

Once the tomographic processing was complete, we used the computer program ***Surfer 21.2*** by Golden Software to construct a color contoured 2D cross-section (profile) illustrating the results for each seismic line.

5.0 INTERPRETATION

The SR profiles described above are models of the subsurface based on P-wave velocities. How these velocities and their subsurface distribution relate to geology is a matter of interpretation. This interpretation can be based on experience and a general knowledge of the local geology. However, the best results are achieved when the models can be correlated with subsurface information provided by other means such as onsite observations, borehole geological and/or geophysical logs, trench logs or projections based on mapped surface geology. This type of information is referred to as “ground truth”.

In any case, the resulting seismic velocity profile represents a model of the subsurface that must be interpreted by the best means available. Thus, the interpreted profile is conceptual in nature, and is not expected to represent an exact depiction of the subsurface.

6.0 LIMITATIONS

Based on the physical properties of refraction (Snell’s Law), in order for a seismic wave to be refracted back toward the surface, the seismic velocity of the upper layer must be less than the velocity of the lower layer. When higher velocities overlie lower velocities, often referred to as a velocity inversion, the seismic energy will be refracted downward and the lower layer will not be detected at the surface. As a result, the calculated depths of any deeper higher velocity layers may be over-estimated. Furthermore, some layers may be truncated or too thin to detect. These are referred to as “hidden layers”.

If the seismic source used for the survey does not produce sufficient energy to propagate through the entire spread at detectable levels, the first arriving P-waves at each geophone may not be visible on the seismic records. Additionally, extraneous seismic energy sources such as wind, traffic or nearby machinery may create “noise” on the recorded waveforms that may mask the first arrivals.

Another common external noise source is overhead power lines. If the cable is laid out parallel to the lines electrical noise may be induced in the cable. Possible internal noise sources may be faulty geophone connections due to dirt or moisture or use of an unsuppressed power supply.

In noisy conditions many “stacks” (multiple shots) may be necessary to achieve an acceptable signal-to-noise ratio. Stacking consists of superposition of waveforms such that the stacked shot energy builds with successive shots, whereas the noise tends to cancel itself out due to its random nature. In extremely noisy conditions it may not be possible to achieve an acceptable signal-to-noise ratio for the greatest shot-to-receiver distance, possibly reducing the maximum depth of investigation.

Finally, seismic refraction processing algorithms are based on the assumption that the seismic velocity layers are isotropic. That is, that the velocity is uniform within the length and breadth of each layer. Another assumption is that the velocity distribution does not change in a direction transverse to the seismic line. In other words, that there is true 2D symmetry. If these conditions are not met, the actual subsurface conditions will vary from those represented by the seismic model.

APPENDIX B:

MASW Sounding Survey

APPENDIX B:
MASW Sounding Survey

1.0 METHODOLOGY

When seismic energy is generated at or near the ground surface, both body and surface waves are produced. Body waves expand omni-directionally throughout the subsurface. They consist of both compressional (P) and shear (S) waves. Surface waves (e.g., Rayleigh, Love, etc.) radiate along the ground surface at velocities that are proportional to shear wave velocity (Vs). Rayleigh waves are characterized by retrograde elliptical particle motion, and travel at approximately 0.9 times the velocity of S-waves.

If a vertical impact source is used, approximately two-thirds of the seismic energy that is produced is in the form of ground roll. As a result, surface waves are typically the most prominent signal on multi-channel seismic records. In addition, surface waves have dispersion properties that body waves lack. That is, different wavelengths have different penetration depths and, therefore, propagate at different velocities. By analyzing the dispersion of surface waves, it is possible to obtain an S-wave versus depth velocity profile. Since s-wave velocity is directly proportional to shear modulus, this provides a direct indication in the variation of stiffness (or rigidity) of subsurface materials.

Surface waves can be recorded and analyzed using a method referred to as Multichannel Analysis of Surface Waves (MASW). This method is used to collect surface wave data using a fixed array of geophones and shot points. This is referred to as a sounding, and results in a one-dimensional (1D) model depicting variation in S-wave velocity versus depth beneath the center of the array. However, the subsurface conditions underlying the entire length of the array, and for several tens of feet to either side, contribute to the measured velocity values. The method requires an energy source that is capable of producing ground roll and geophones that are capable of detecting low frequencies (<10 Hz) signals.

2.0 INSTRUMENTATION

The seismic waveforms produced at each shot point were recorded using a Geometrics ***Geode*** 24-channel engineering distributed array seismograph, as pictured in Figure 1, and ***RT Clark*** geophones with a natural frequency of 4.5 Hz. The geophones were coupled to the ground surface by a metal spike affixed to the bottom of each geophone case. Seismic energy was produced at each shot point by multiple impacts with a 16-pound sledgehammer against a metal strike plate placed on the ground surface. The seismic waveforms were digitized, processed and amplified by the Geode, transmitted via a ruggedized Ethernet cable to a field computer and algebraically summed (stacked) until sufficient signal to noise ratio was achieved. The data were displayed on the computer's LCD screen in the form of seismograms, analyzed for quality assurance and

archived for subsequent processing. These images were subsequently used to determine the time required for P-waves to travel from each shot point to each geophone in the array (spread).

Figure 1: *Geometrics Geode 24-channel engineering distributed array seismograph.*

3.0 DATA ACQUISITION

We acquired two MASW soundings, designated as MASW-1 and MASW-2, as described in the main body of the report. The sounding locations were determined by Langan personnel. The positions of the MASW arrays are shown by the blue lines on the site location map (Plate 1). The center points of the arrays, which are considered the sounding locations, are represented by the blue diamonds. For each sounding, the seismic equipment was set out in a collinear array consisting of 24-geophones and four shot-points. The geophone stationing interval was 6-ft and shot-points were placed 2- and 6-stations off each end of the arrays, for a total line length of 210-ft. The maximum depth of exploration is determined by the frequency content of the seismograms and is estimated at 100-ft for each sounding. The configuration of each seismic array is depicted by the diagram in Figure 2, below.

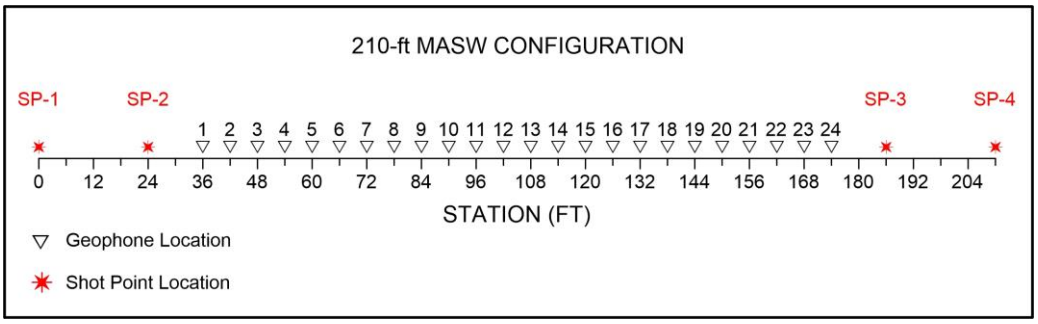


Figure 2: *MASW Array Configuration.*

4.0 DATA ANALYSIS

The seismic wave-traces (shot gathers) recorded at each shot point were analyzed using the computer program ***SURFSEIS*** developed by the Kansas Geological Survey (Version 5.0, 2016). This interactive program converts the data acquired from all four shot points in a given sounding into a dispersion curve representing phase velocity versus frequency. This curve is then inverted to produce a 1D model indicating S-wave velocity versus depth. The steps involved in this procedure are as follows:

1) The shot gathers are converted to KGS format.
2) Stations are assigned to the geophone and shot point locations.
3) The resulting records are viewed to determine their overall quality. If necessary, portions of the records are muted to remove interference from refractions, reflections and higher mode events.
4) For each formatted (and/or muted) record, the program produces what is referred to as an "overtone plot". This is a colored cross-section indicating phase velocity versus frequency and amplitude. The vertical axis represents phase velocity (increasing upward); the horizontal axis represents frequency (increasing to the right); and signal amplitude is indicated by various colors, with the hottest colors (orange to red to dark brown) representing the greatest signal to noise ratio. Typically, the strongest signals align in a curved pattern with a symmetry with the shape of a "hockey stick" where the blade is pointing upward at the lower end of the frequency spectrum (higher velocity at greater depth) and the handle projects to the right in the direction of increasing frequencies indicating lower velocities.
5) The overtone plots compiled from the four shot points are reviewed to determine their overall quality and the best among them (possibly all) are merged to form a single overtone. This enhances the overall signal to noise ratio of the survey and incorporates data from both ends of the spread (if feasible).
6) The resulting overtone plot is used as a guide in deriving a dispersion curve representing phase velocity versus frequency. This is done by fitting the curve along the center of the hockey stick where the signal to noise ratio is highest.
7) The resulting dispersion curve is inverted through an iterative process to compute a 1D model representing S-wave velocity versus depth.

The shear-wave velocities in each depth range for the soundings are tabulated in Section 5.3 of the main body of the report. The results are also presented graphically by the step-chart graphs on Plates 3 and 4.

5.0 LIMITATIONS

Extraneous seismic energy sources such as wind, traffic or nearby machinery may create “noise” on the recorded waveforms. Also, live electric lines may induce unwanted electrical current into the seismic cable, also creating noise. If the seismic source used for the survey does not produce sufficient energy to propagate through the entire spread at detectable levels, the wave forms created by the surface waves may be overly contaminated by noise and reduce the signal-to-noise ratio and thus the data quality.

In noisy conditions many “stacks” may be necessary to achieve an acceptable signal-to-noise ratio. Stacking consists of superposition of waveforms such that the stacked shot energy builds with successive shots whereas the noise tends to cancel itself out due to its random nature. In some cases, however, noise is not sufficiently random to be reduced to acceptable levels.

APPENDIX F

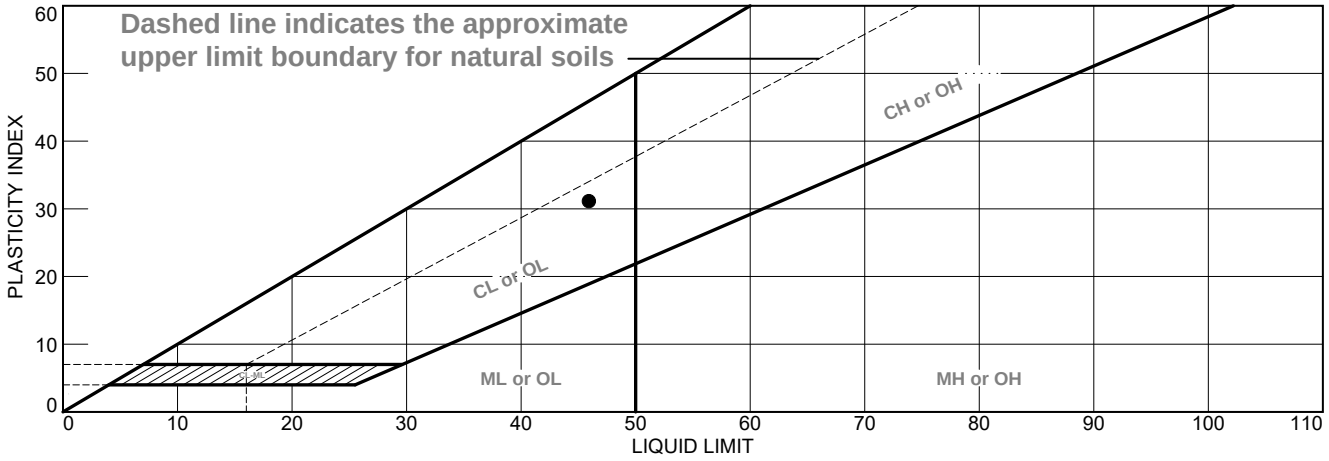
LABORATORY TEST RESULTS BY ARUP/RYCG

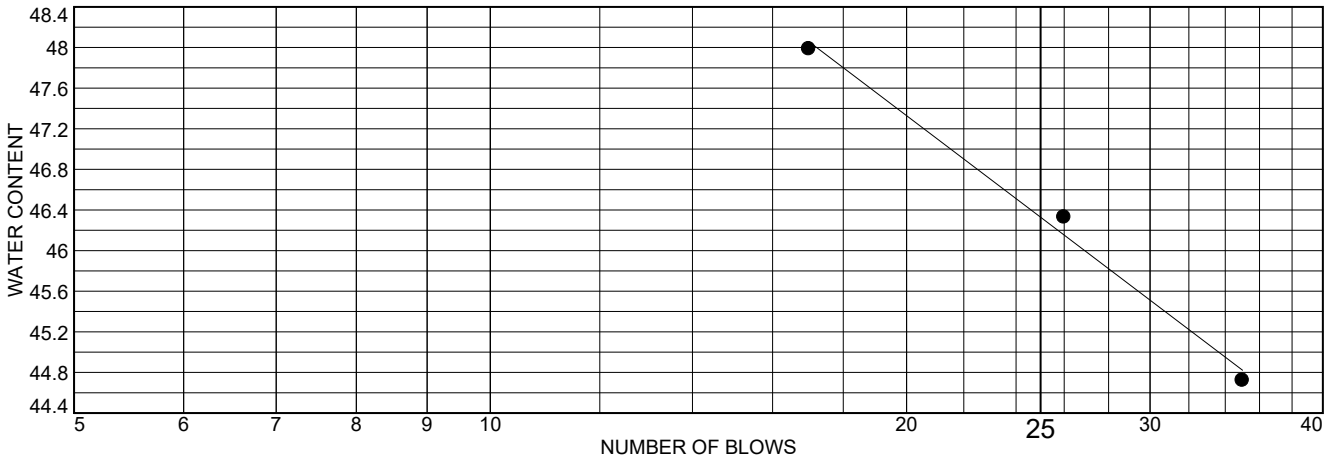
MOISTURE & DENSITY TEST

Client : ARUP/RYCG JV Project : SFMTA Potrero ISI Lab No.: G-62084 Job no : 260018-00 2018-001

	Boring #	BH-06	BH-02	BH-02					
	Sample #	6-2A	2-2B	2-14B					
	Depth (ft.)	5.5-6	6.5-7	75.5-76					
	Soil type: (visual)	Brown sandy clay	Reddish brown silty, clayey sand	Gray bedrock					
1.	Date tested:	04/15/18	04/15/18	04/09/18					
2.	Tested by:	JH	JH	JH					
3.	Specimen height (in.)	4.71	6.00						
4.	Wt. of specimen + tare (gm)	704.01	959.19						
5.	Tare wt. (gm)	0.00	0.00						
6.	Diameter (in.)	2.40	2.39						
7.	Wet wt. of soil + dish wt. (gm)	439.77	211.93	489.90					
8.	Dry wt. of soil + dish wt. (gm)	400.56	190.90	479.76					
9.	Wt. of dish (gm)	187.58	51.47	188.32					
10.	Dish ID								
	Wet Density (pcf)	125.8	135.6						
	Dry Density (pcf)	106.2	117.9						
	Moisture Content (%)	18.4	15.1	3.5					
	Gs (Assumed)	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
	Void Ratio	0.586	0.429						
	Saturation (%)	84.8	94.8						
	Additional data:								
	Wt. of dry soil + dish before washing (gm)								
	Wt. of dry soil + dish after washing (gm)								
	% Passing # 200 sieve								
	USCS symbol								

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown clay with sand	46	15	31	97	72	CL

Project No. 2657-003.0 **Client:** ARUP/RYCG JV

Project: SFMTA Potrero

260018-00 2018-001

●**Source of Sample:** BH-01 **Depth:** 3.5-4.5 **Sample Number:** 1-1B & 1-1C

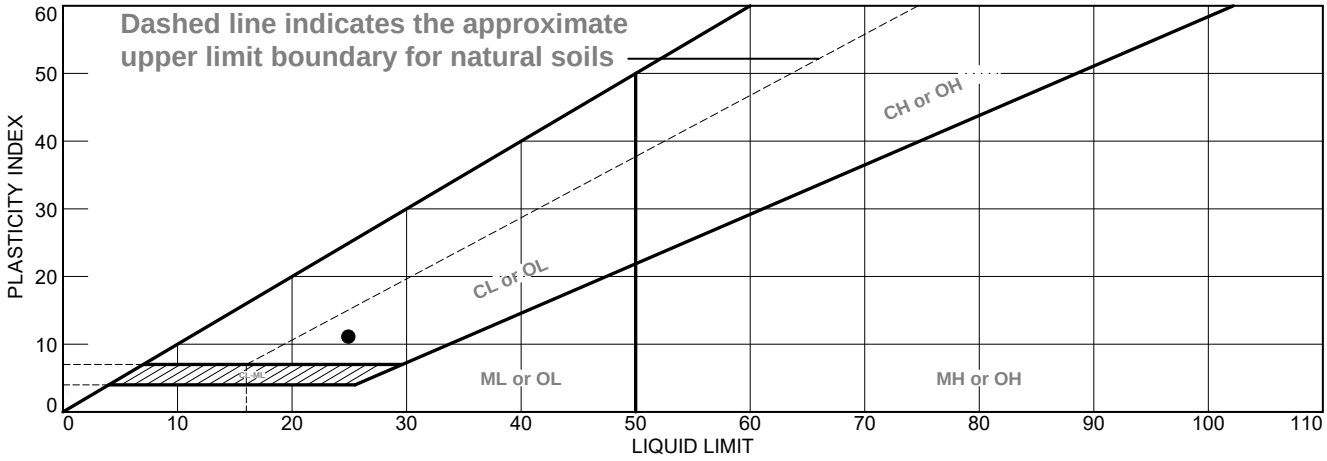
Remarks:

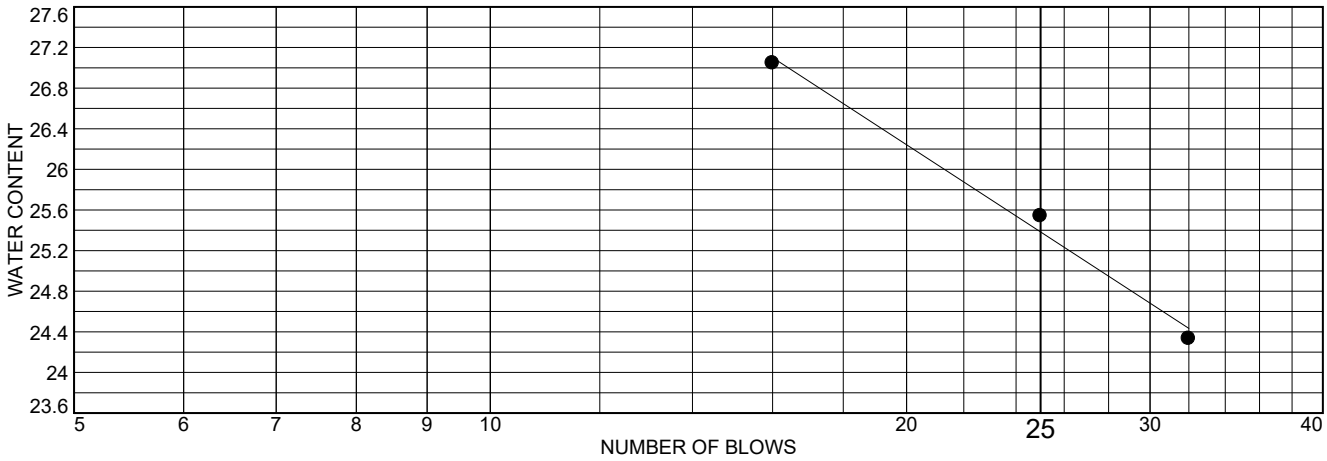
●Combined both samples

Figure

Tested By: JH **Checked By:** JH

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown clayey sand	25	14	11	99	43	SC

Project No. 2657-003.0 **Client:** ARUP/RYCG JV

Project: SFMTA Potrero

260018-00 2018-001

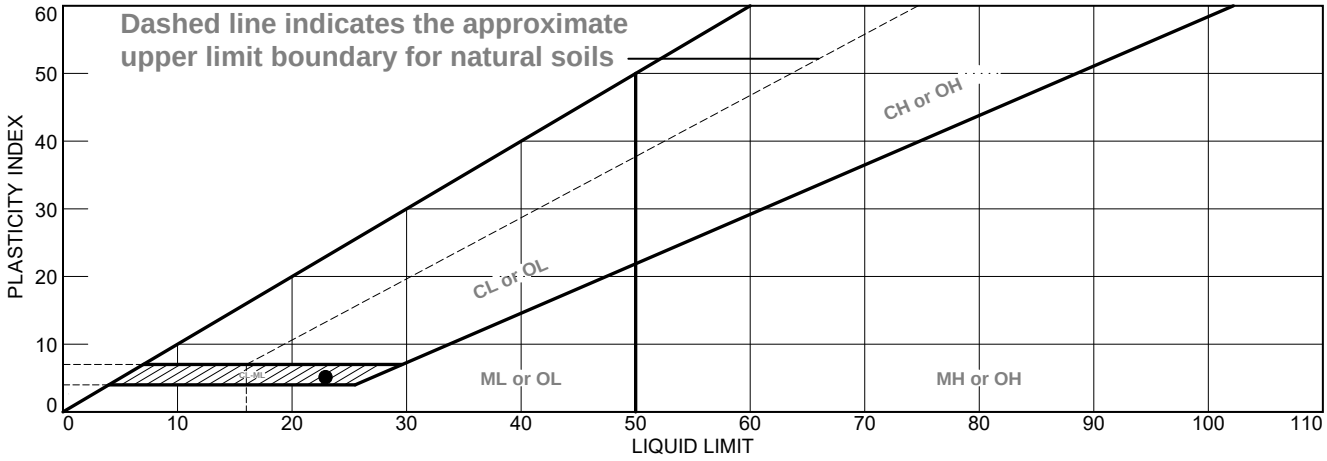
●**Source of Sample:** BH-01 **Depth:** 11-11.5 **Sample Number:** 1-3B

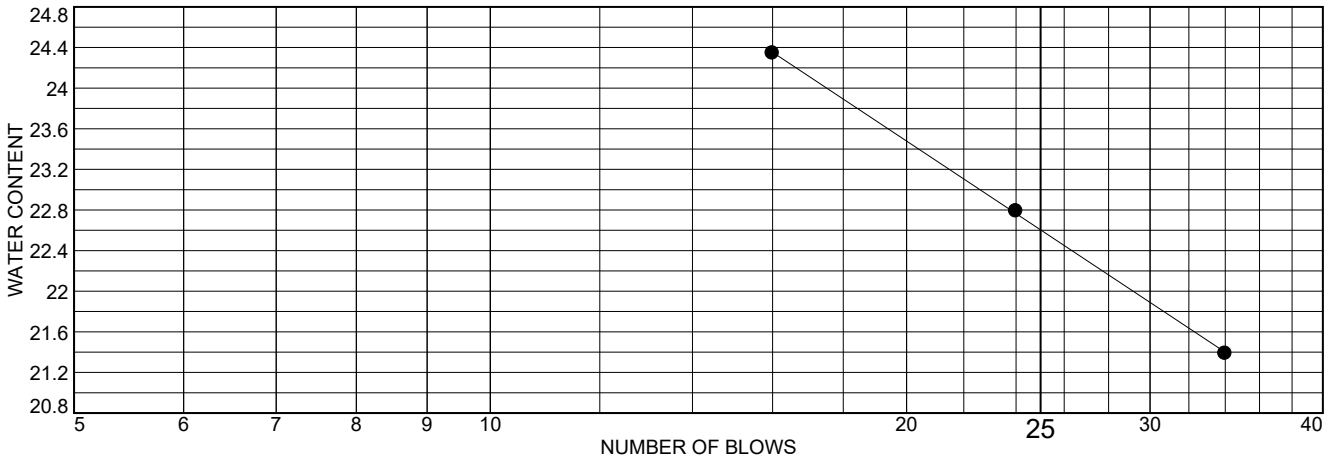
Remarks:

Figure

Tested By: JH **Checked By:** JH

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Reddish brown silty, clayey sand	23	18	5	97	23	SC-SM

Project No. 2657-003.0 **Client:** ARUP/RYCG JV

Project: SFMTA Potrero
260018-00 2018-001

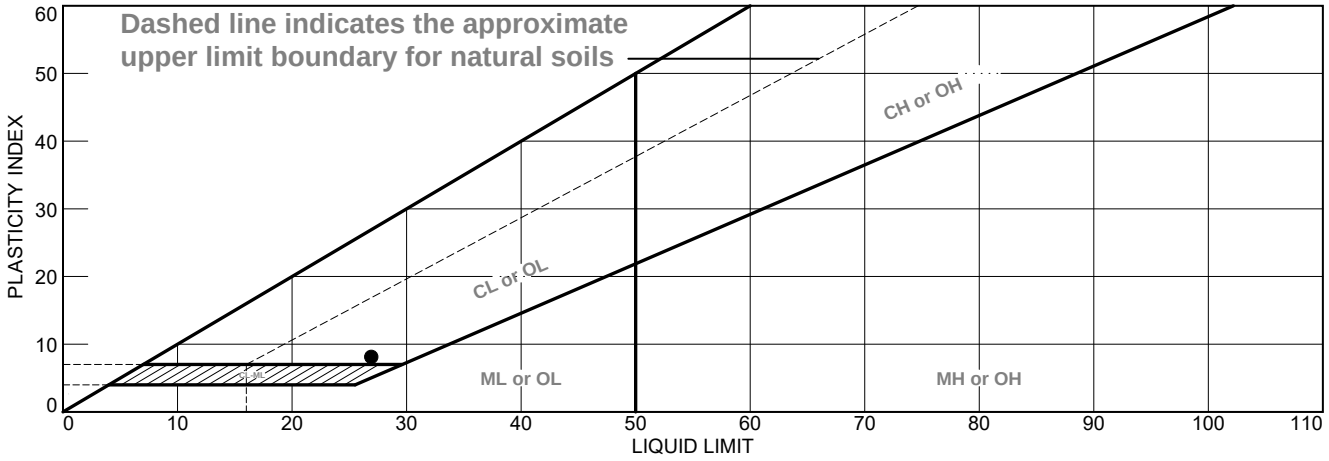
●**Source of Sample:** BH-02 **Depth:** 6.5-7 **Sample Number:** 2-2B

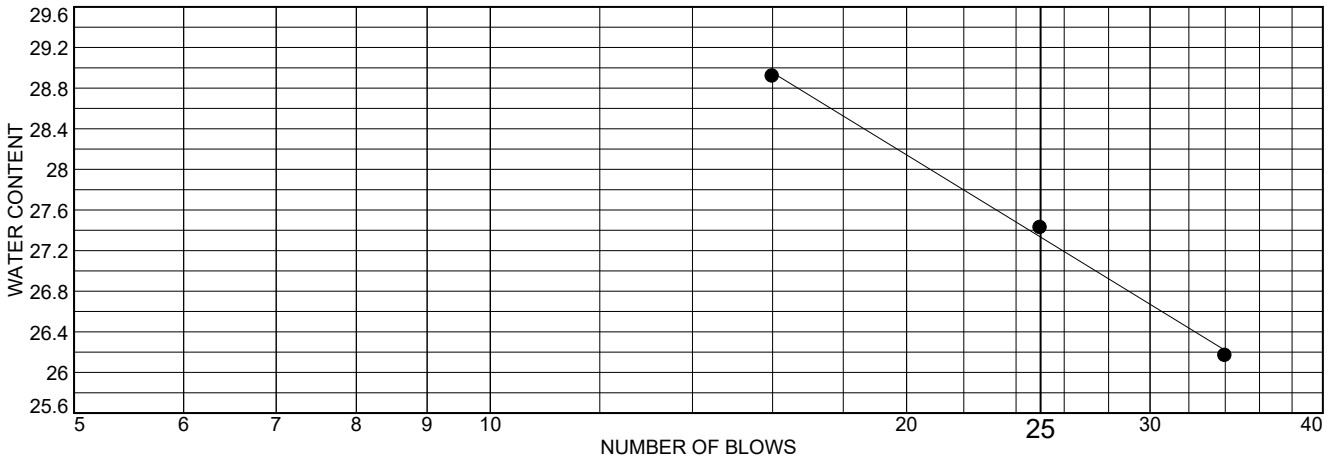
Remarks:

Figure

Tested By: JH **Checked By:** JH

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sand with clay	27	19	8	95	25	SC

Project No. 2657-003.0 **Client:** ARUP/RYCG JV

Project: SFMTA Potrero
260018-00 2018-001

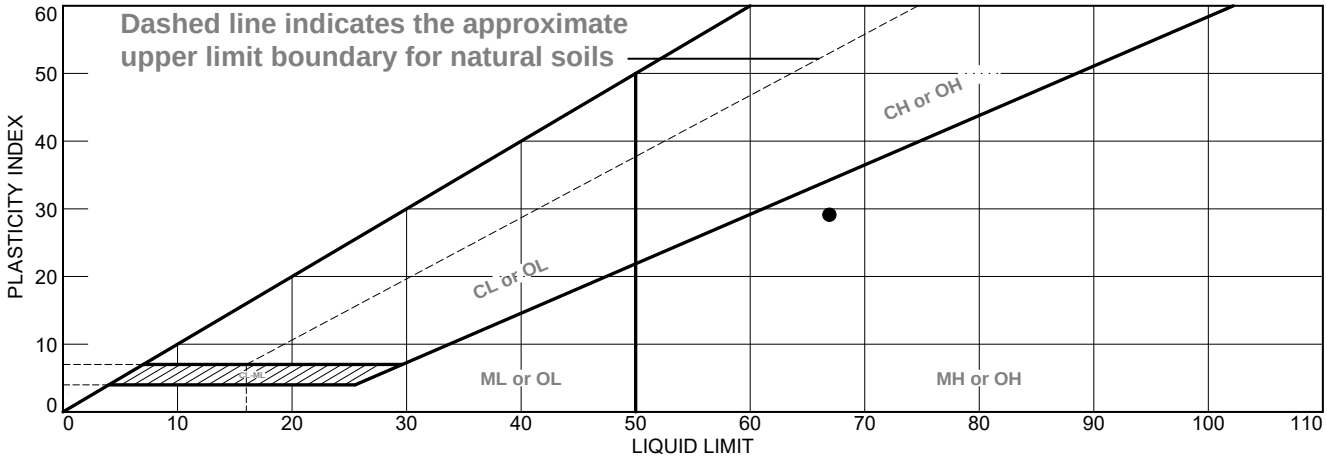
●**Source of Sample:** BH-03 **Depth:** 6-6.5 **Sample Number:** 3-2B

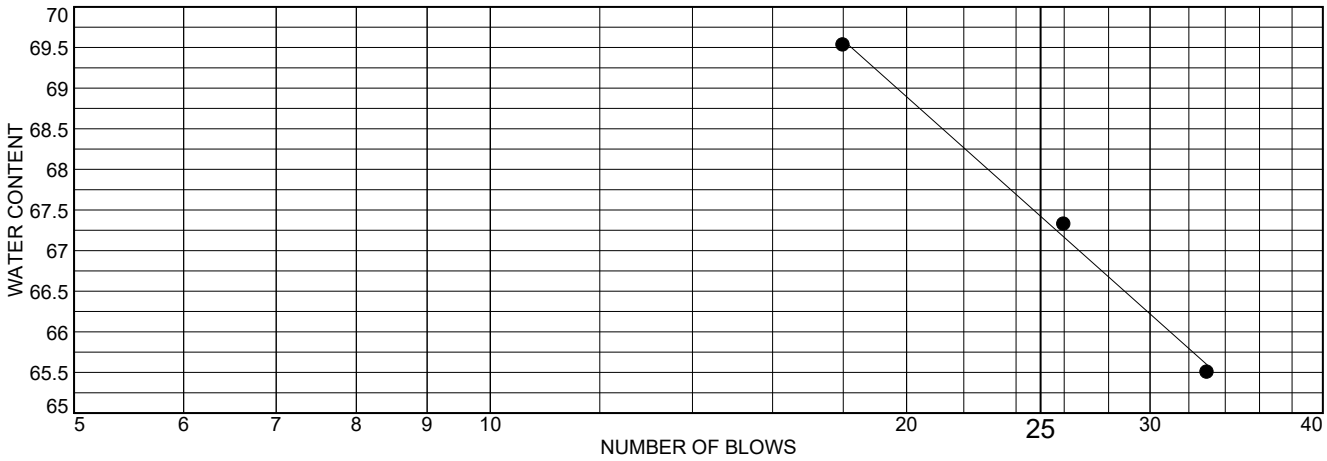
Remarks:

Figure

Tested By: JH **Checked By:** JH

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy silt with gravel	67	38	29	62	49	SM

Project No. 2657-003.0 **Client:** ARUP/RYCG JV

Project: SFMTA Potrero
260018-00 2018-001

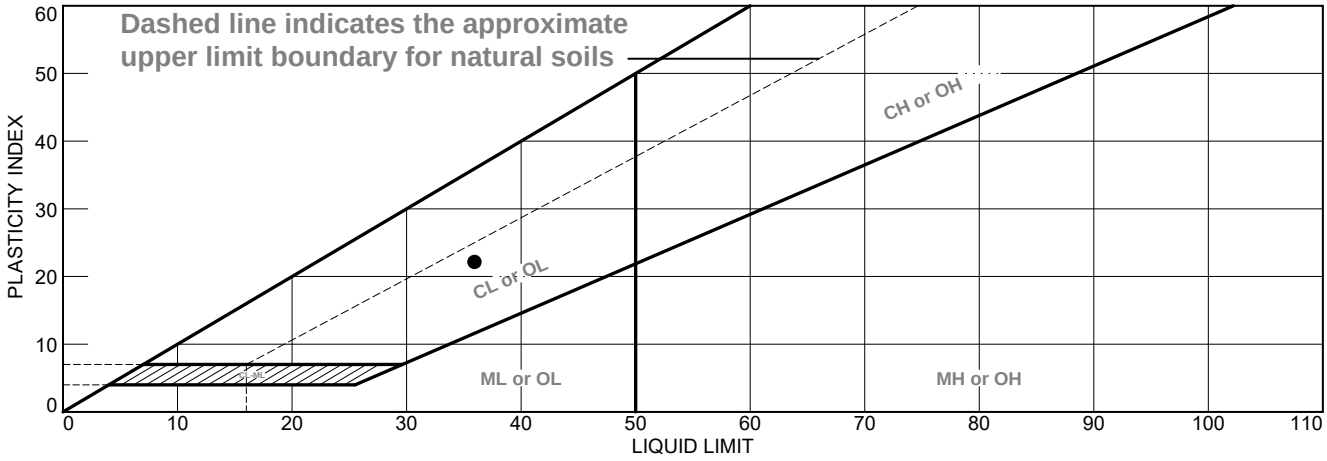
●**Source of Sample:** BH-04 **Depth:** 5-5.5 **Sample Number:** 4-2B

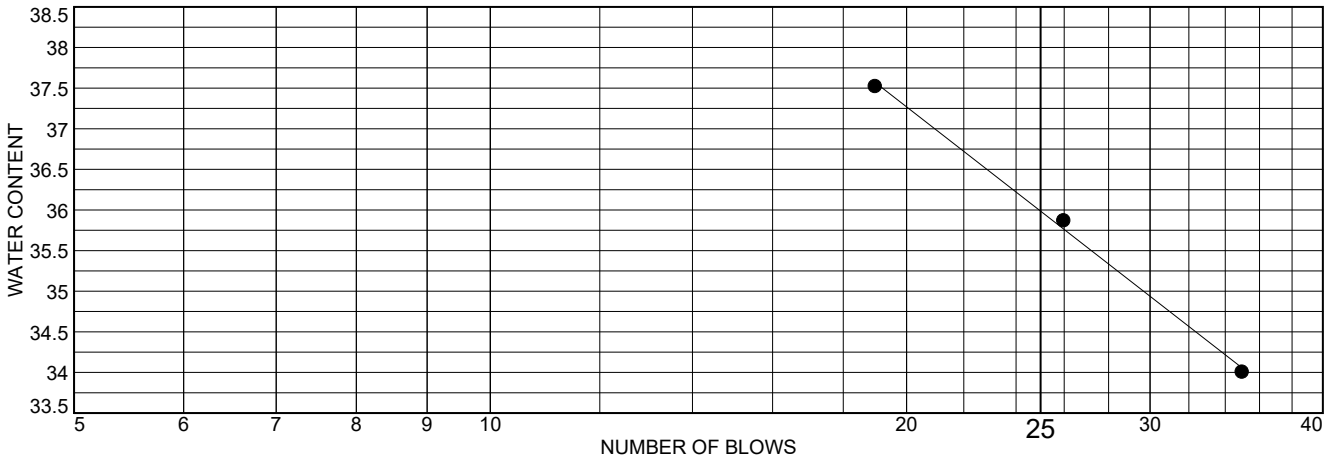
Remarks:

Figure

Tested By: JH **Checked By:** JH

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Reddish brown clayey sand	36	14	22	96	49	SC

Project No. 2657-003.0 **Client:** ARUP/RYCG JV

Project: SFMTA Potrero
260018-00 2018-001

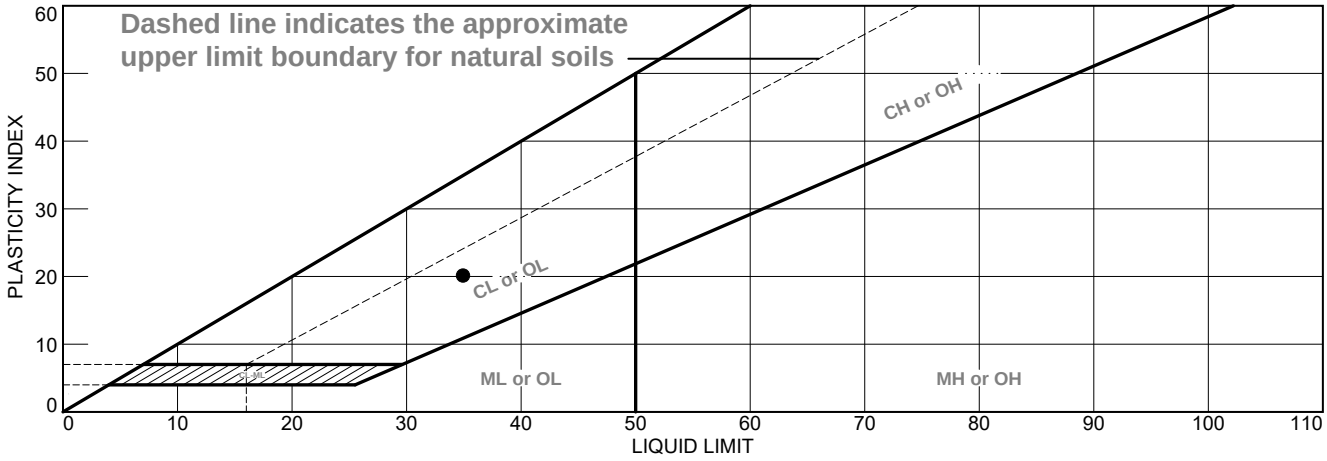
●**Source of Sample:** BH-04 **Depth:** 15-15.5 **Sample Number:** 4-4B

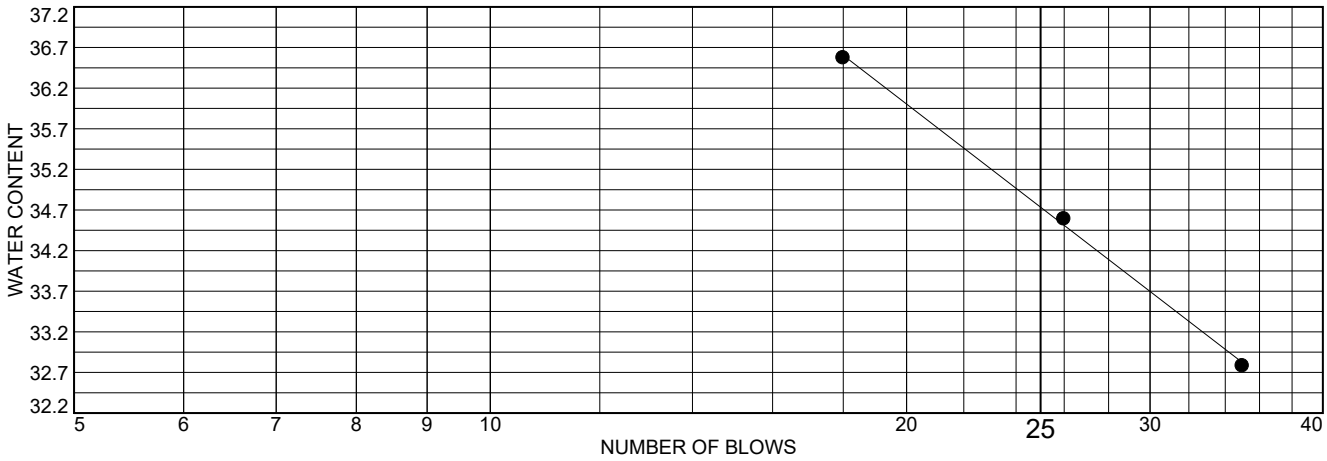
Remarks:

Figure

Tested By: JH **Checked By:** JH

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy clay	35	15	20	96	69	CL

Project No. 2657-003.0 **Client:** ARUP/RYCG JV

Project: SFMTA Potrero
260018-00 2018-001

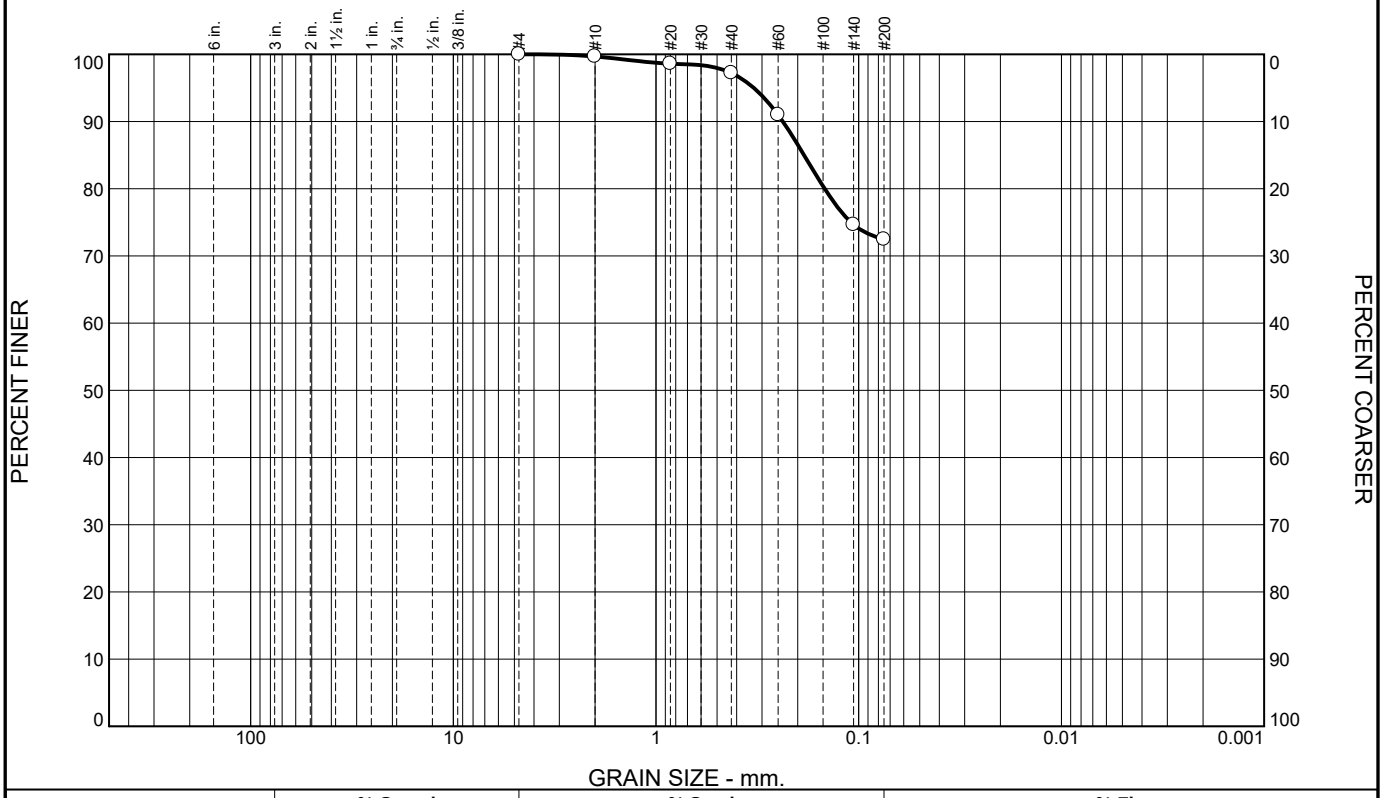
●**Source of Sample:** BH-06 **Depth:** 5.5-6 **Sample Number:** 6-2A

Remarks:

Figure

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	3	25	72	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	100		
#20	99		
#40	97		
#60	91		
#140	75		
#200	72		

* (no specification provided)

Soil Description

Brown clay with sand

Atterberg Limits

PL= 15 LL= 46 PI= 31

Coefficients

D_{90}= 0.2368 D_{85}= 0.1861 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(20)

Remarks

Combined both samples

Source of Sample: BH-01 **Depth:** 3.5-4.5
Sample Number: 1-1B & 1-1C

Date: 4-20-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0

Figure

Tested By: JH **Checked By:** JH

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	1	56	43	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100		
#4	100		
#10	100		
#20	100		
#40	99		
#60	88		
#140	45		
#200	43		

* (no specification provided)

Soil Description

Brown clayey sand

Atterberg Limits

PL= 14 LL= 25 PI= 11

Coefficients

D_{90}= 0.2626 D_{85}= 0.2333 D_{60}= 0.1495
D_{50}= 0.1221 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(1)

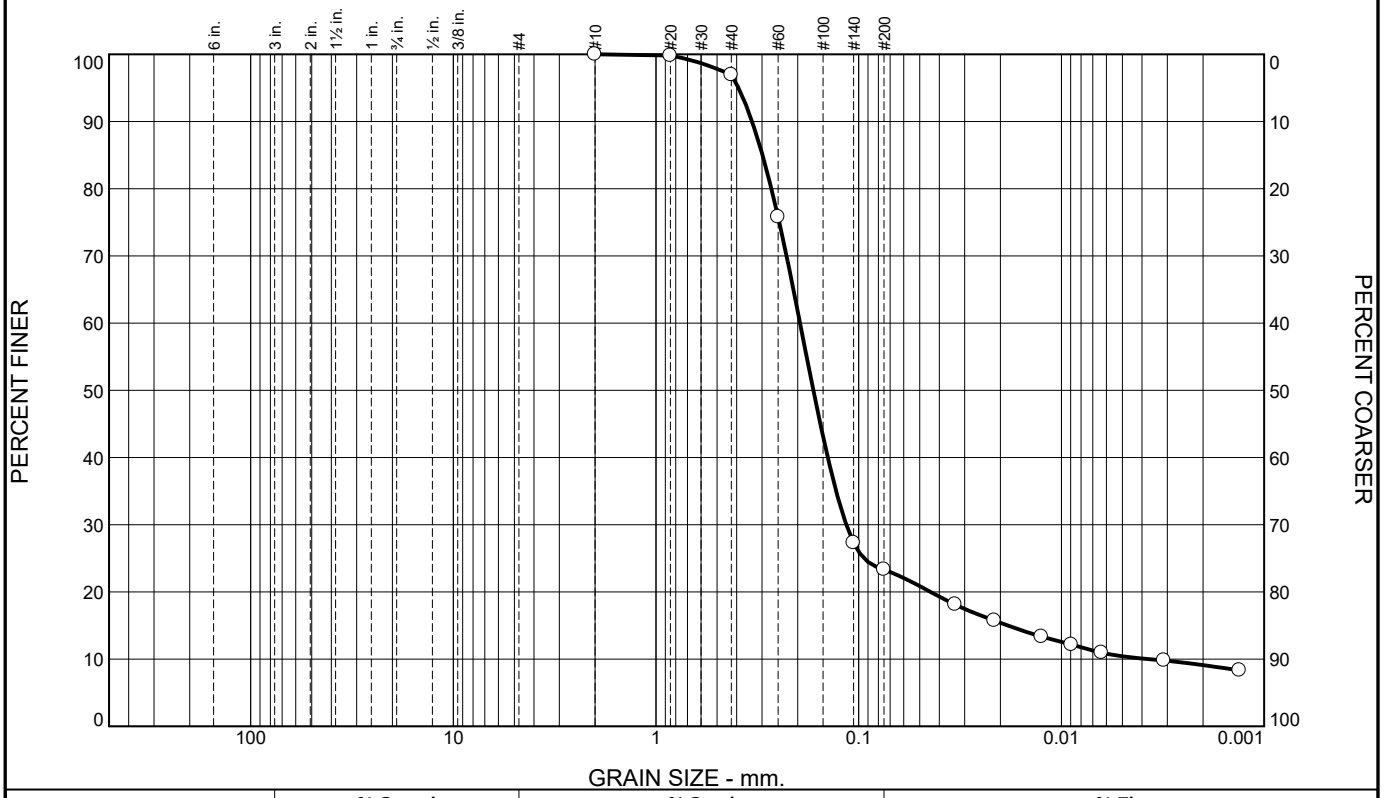
Remarks

Source of Sample: BH-01 **Depth:** 11-11.5
Sample Number: 1-3B **Date:** 4-20-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	3	74	13	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100		
#20	100		
#40	97		
#60	76		
#140	27		
#200	23		
0.0335 mm.	18		
0.0214 mm.	16		
0.0125 mm.	13		
0.0089 mm.	12		
0.0063 mm.	11		
0.0031 mm.	9.8		
0.0013 mm.	8.3		

* (no specification provided)

Soil Description

Reddish brown silty, clayey sand

Atterberg Limits

PL= 18 LL= 23 PI= 5

Coefficients

D_{90}= 0.3360 D_{85}= 0.2984 D_{60}= 0.1948
D_{50}= 0.1674 D_{30}= 0.1153 D_{15}= 0.0184
D_{10}= 0.0037 C_u= 52.62 C_c= 18.42

Classification

USCS= SC-SM AASHTO= A-2-4(0)

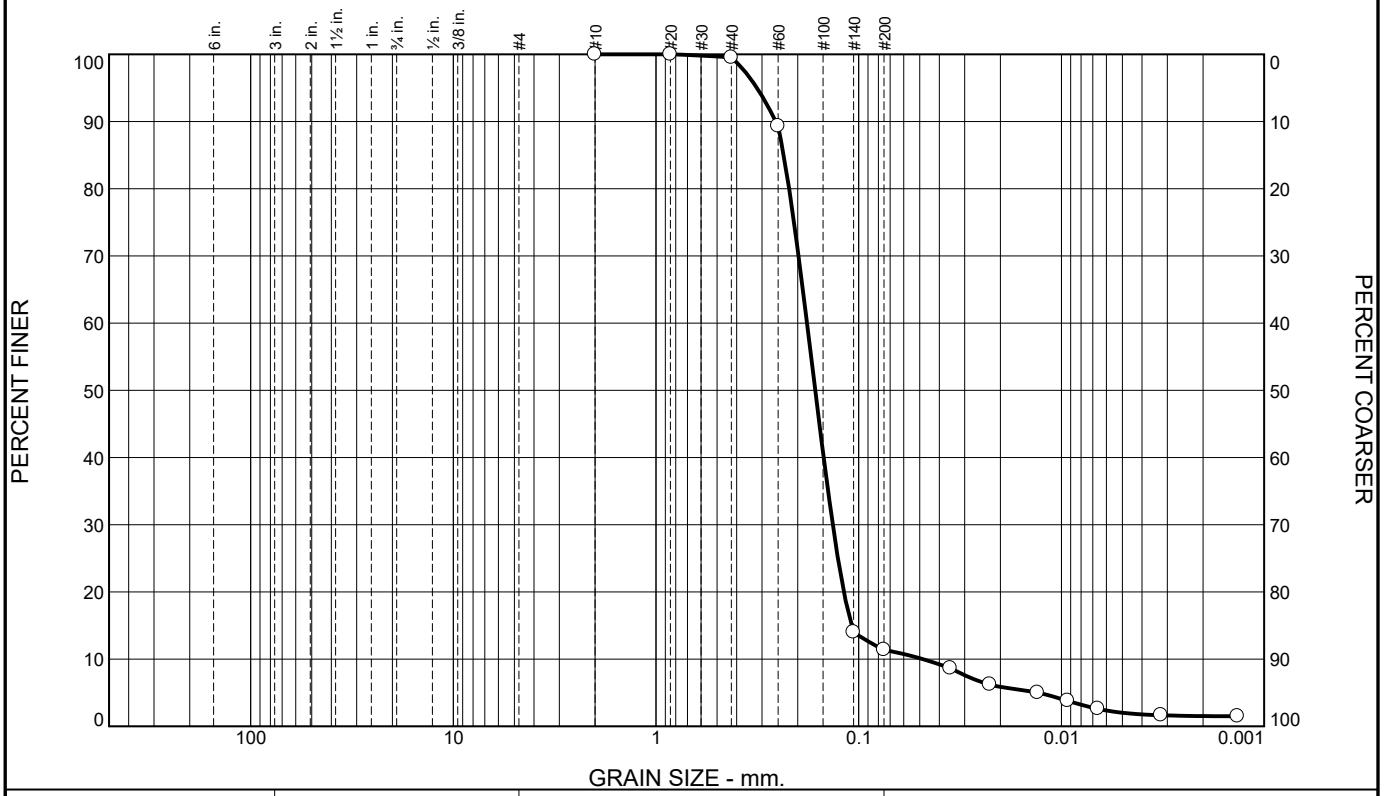
Remarks

Source of Sample: BH-02 **Depth:** 6.5-7
Sample Number: 2-2B **Date:** 4-20-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	89	9	2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100		
#20	100		
#40	100		
#60	89		
#140	14		
#200	11		
0.0352 mm.	8.7		
0.0225 mm.	6.2		
0.0131 mm.	5.0		
0.0093 mm.	3.8		
0.0066 mm.	2.6		
0.0032 mm.	1.6		
0.0014 mm.	1.5		

* (no specification provided)

Soil Description

Brown sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2566 D_{85}= 0.2347 D_{60}= 0.1799
D_{50}= 0.1639 D_{30}= 0.1343 D_{15}= 0.1085
D_{10}= 0.0483 C_u= 3.72 C_c= 2.08

Classification

USCS= AASHTO=

Remarks

Source of Sample: BH-02 **Depth:** 36-36.5
Sample Number: 2-8B **Date:** 4-30-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	2	89	9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100		
#20	100		
#40	98		
#60	80		
#140	12		
#200	9.5		

* (no specification provided)

Soil Description

Brown sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3032 D_{85}= 0.2726 D_{60}= 0.1962
D_{50}= 0.1763 D_{30}= 0.1413 D_{15}= 0.1133
D_{10}= 0.0801 C_u= 2.45 C_c= 1.27

Classification

USCS= AASHTO=

Remarks

Source of Sample: BH-02 **Depth:** 41-41.5
Sample Number: 2-9B **Date:** 5-10-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	5	70	25	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	100		
#20	100		
#40	95		
#60	75		
#140	29		
#200	25		

* (no specification provided)

Soil Description

Brown sand with clay

Atterberg Limits

PL= 19 LL= 27 PI= 8

Coefficients

D_{90}= 0.3510 D_{85}= 0.3062 D_{60}= 0.1936
D_{50}= 0.1653 D_{30}= 0.1105 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-4(0)

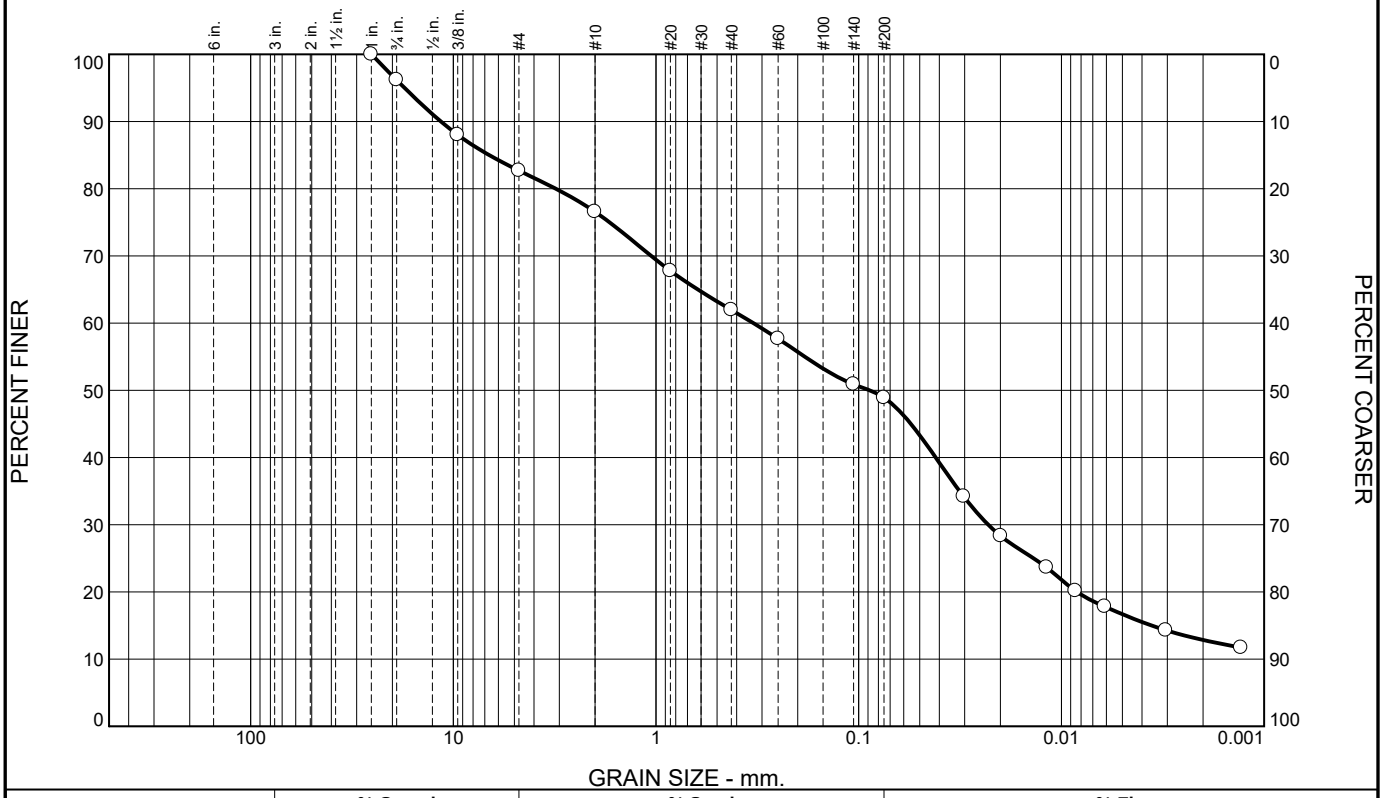
Remarks

Source of Sample: BH-03 **Depth:** 6-6.5
Sample Number: 3-2B **Date:** 4-20-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	4	13	6	15	13	32	17

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100		
3/4	96		
3/8	88		
#4	83		
#10	77		
#20	68		
#40	62		
#60	58		
#140	51		
#200	49		
0.0304 mm.	34		
0.0199 mm.	28		
0.0118 mm.	24		
0.0085 mm.	20		
0.0061 mm.	18		
0.0030 mm.	14		
0.0013 mm.	12		

* (no specification provided)

Soil Description

Brown sandy silt with gravel

Atterberg Limits

PL= 38 LL= 67 PI= 29

Coefficients

D_{90}= 11.5208 D_{85}= 6.6627 D_{60}= 0.3312
D_{50}= 0.0884 D_{30}= 0.0230 D_{15}= 0.0036
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-7-5(11)

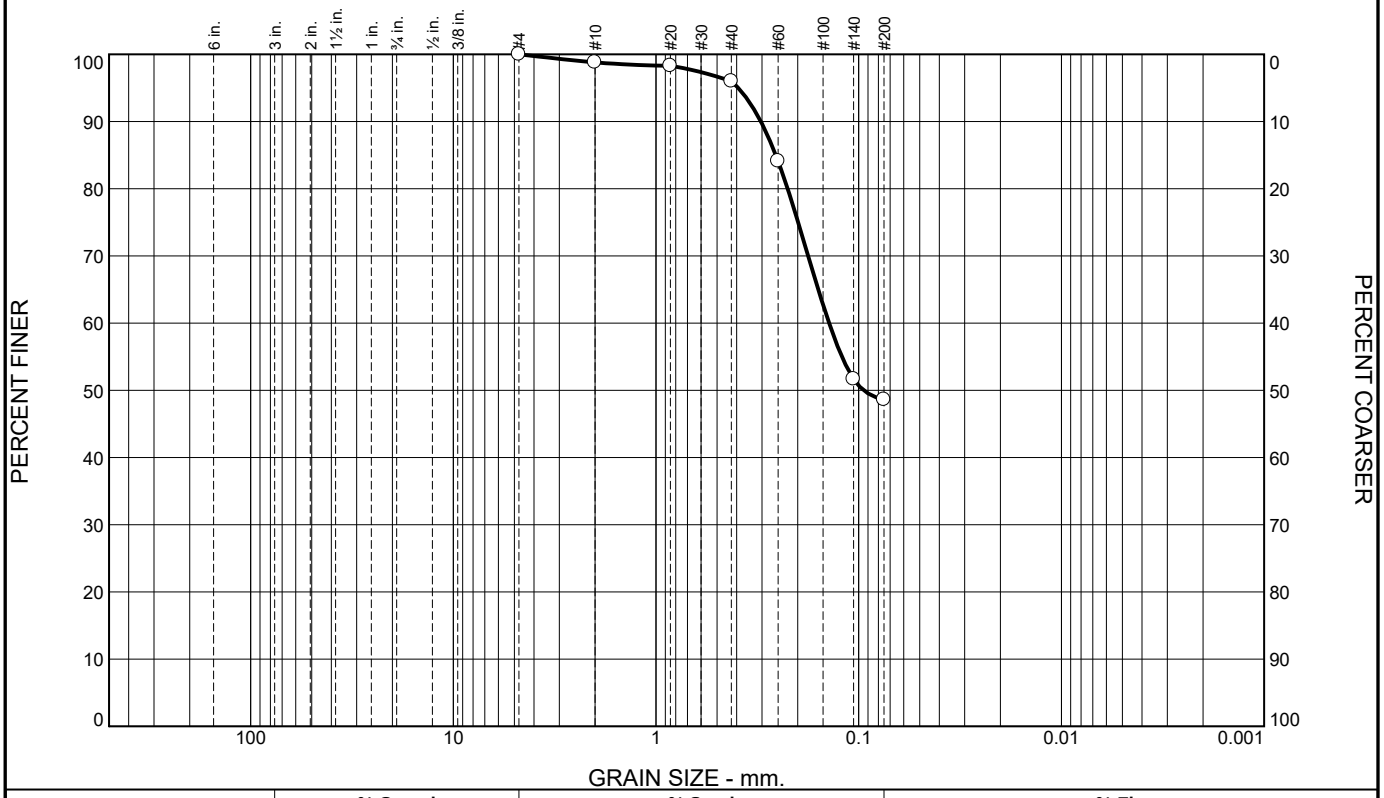
Remarks

Source of Sample: BH-04 **Depth:** 5-5.5
Sample Number: 4-2B **Date:** 4-20-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	3	47	49	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	99		
#20	98		
#40	96		
#60	84		
#140	52		
#200	49		

* (no specification provided)

Soil Description

Reddish brown clayey sand

Atterberg Limits

PL= 14 LL= 36 PI= 22

Coefficients

D_{90}= 0.3041 D_{85}= 0.2566 D_{60}= 0.1400
D_{50}= 0.0947 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(7)

Remarks

Source of Sample: BH-04 **Depth:** 15-15.5
Sample Number: 4-4B **Date:** 5-7-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	2	56	42	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	100		
#20	99		
#40	98		
#60	84		
#140	46		
#200	42		

* (no specification provided)

Soil Description

Reddish brown clayey sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2935 D_{85}= 0.2548 D_{60}= 0.1541
D_{50}= 0.1230 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

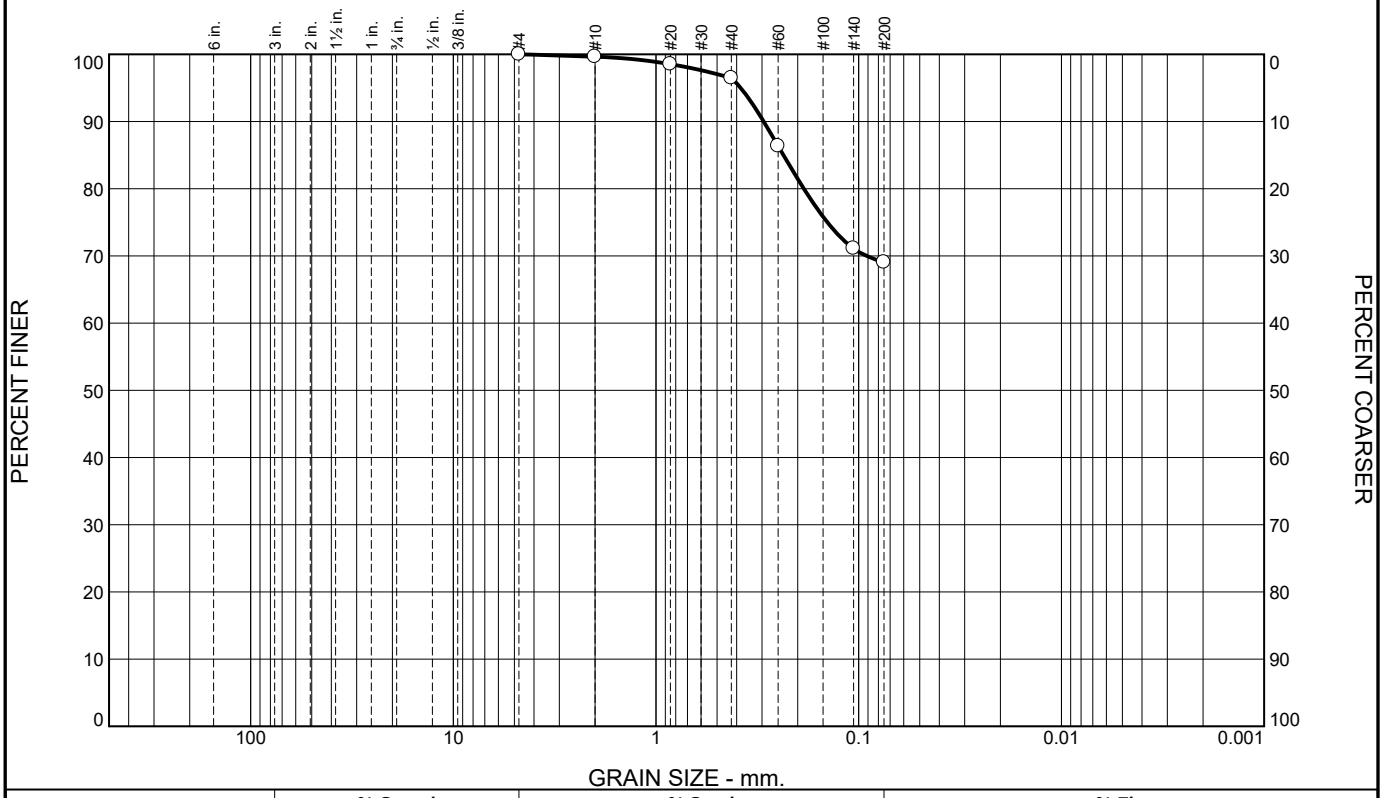
Remarks

Source of Sample: BH-04 **Depth:** 20-20.5
Sample Number: 4-5B **Date:** 5-11-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0 **Figure**

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	4	27	69	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	100		
#20	99		
#40	96		
#60	86		
#140	71		
#200	69		

* (no specification provided)

Soil Description

Brown sandy clay

Atterberg Limits

PL= 15 LL= 35 PI= 20

Coefficients

D_{90}= 0.2945 D_{85}= 0.2353 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(11)

Remarks

Source of Sample: BH-06 **Depth:** 5.5-6
Sample Number: 6-2A

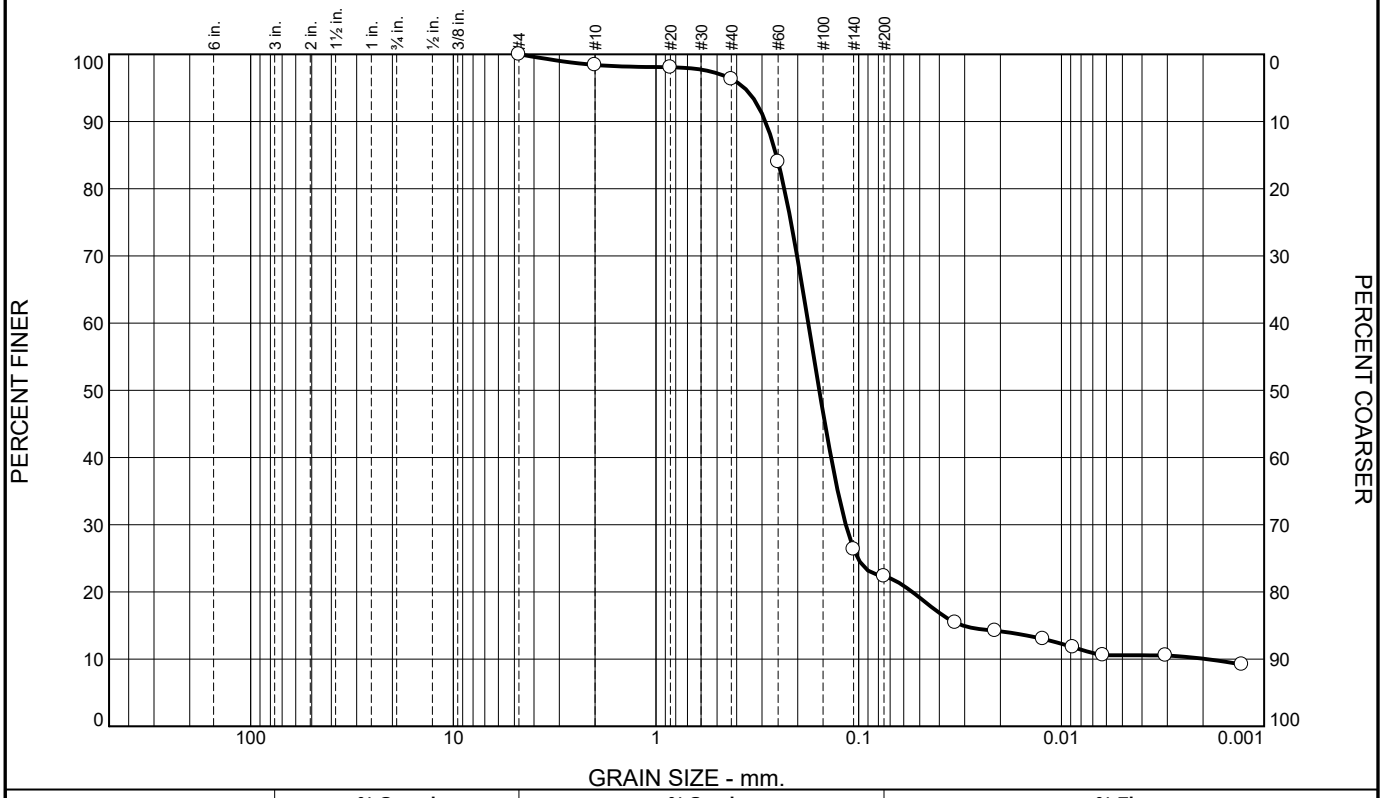
Date: 4-20-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0

Figure

Tested By: JH **Checked By:** JH

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	2	2	74	11	11

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	98		
#20	98		
#40	96		
#60	84		
#140	26		
#200	22		
0.0334 mm.	15		
0.0212 mm.	14		
0.0123 mm.	13		
0.0088 mm.	12		
0.0062 mm.	11		
0.0031 mm.	11		
0.0013 mm.	9.2		

* (no specification provided)

Soil Description

Brown clayey sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2887 D_{85}= 0.2550 D_{60}= 0.1774
D_{50}= 0.1565 D_{30}= 0.1159 D_{15}= 0.0306
D_{10}= 0.0019 C_u= 92.35 C_c= 39.45

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: BH-06 **Depth:** 15-15.5
Sample Number: 6-4B **Date:** 5-10-18

Client: ARUP/RYCG JV
Project: SFMTA Potrero
260018-00 2018-001
Project No: 2657-003.0 **Figure**

Tested By: JH **Checked By:** JH

UNCONSOLIDATED UNDRAINED COMPRESSION TEST - ASTM D2850

Client : ARUP/RYCG JV
Project : SFMTA Potrero
Job # : 260018-00 2018-001
Boring # BH-01
Sample # : 1-13B
Depth (ft) : 60.25-60.75
Date tested : 04/15/18
Soil : Greenish gray bedrock

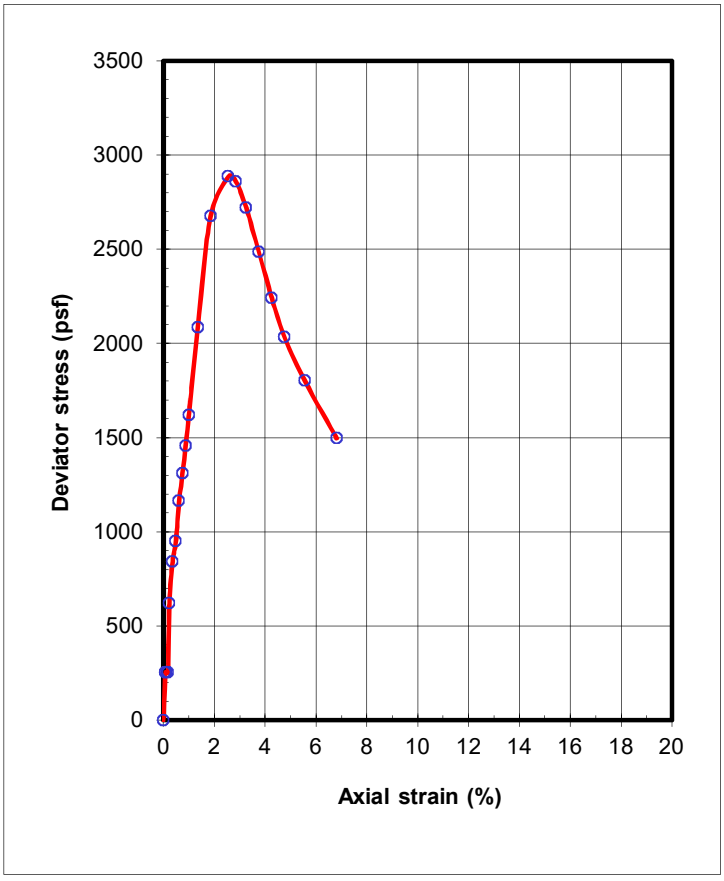
Data Reduction:

Dial factor = 1.0 in/unit
Load factor = 1.0 lb/unit

Specimen:
Total wt. = 863.4 gms
Ht. = 5.720 in
Ave dia. = 2.397 in
Area = 4.513 sq.in
Volume = 423.0 c.c.
Shearing rate = 0.03 inch/min
Shearing rate = 0.5 %/min
Gs (assumed) = 2.70

Test Report:
Void ratio = 0.595
Ht/Dia ratio = 2.39
Moisture = 20.6 %
Total density = 127.4 pcf
Dry density = 105.6 pcf
Saturation = 93.4 %
Chamber pressure = 5040 psf
Max. deviator stress = 2886 psf
Strain @ failure = 2.55 %

Dial Read.	Load Read.	Axial Strain (%)	Deviator Stress (psf)
-0.002		0.00	0.0
0.003	8.0	0.08	254.6
0.006	8.0	0.13	254.5
0.009	8.0	0.18	254.3
0.011	19.5	0.23	620.5
0.019	26.5	0.36	842.6
0.026	29.9	0.49	950.8
0.033	36.7	0.61	1163.4
0.041	41.4	0.75	1311.1
0.048	46.1	0.87	1457.5
0.055	51.2	1.00	1618.8
0.075	66.2	1.35	2083.8
0.104	85.5	1.85	2676.0
0.144	92.8	2.55	2886.5
0.161	92.3	2.85	2860.5
0.184	88.1	3.25	2719.8
0.213	80.9	3.75	2484.7
0.242	73.3	4.26	2239.7
0.270	66.9	4.75	2034.5
0.316	59.8	5.56	1802.9
0.388	50.3	6.81	1496.1



UNCONSOLIDATED UNDRAINED COMPRESSION TEST - ASTM D2850

Client : ARUP/RYCG JV
Project : SFMTA Potrero
Job # : 260018-00 2018-001
Boring # BH-02
Sample # : 2-4B
Depth (ft) : 16-16.5
Date tested : 04/15/18
Soil : Grayish brown clay with sand

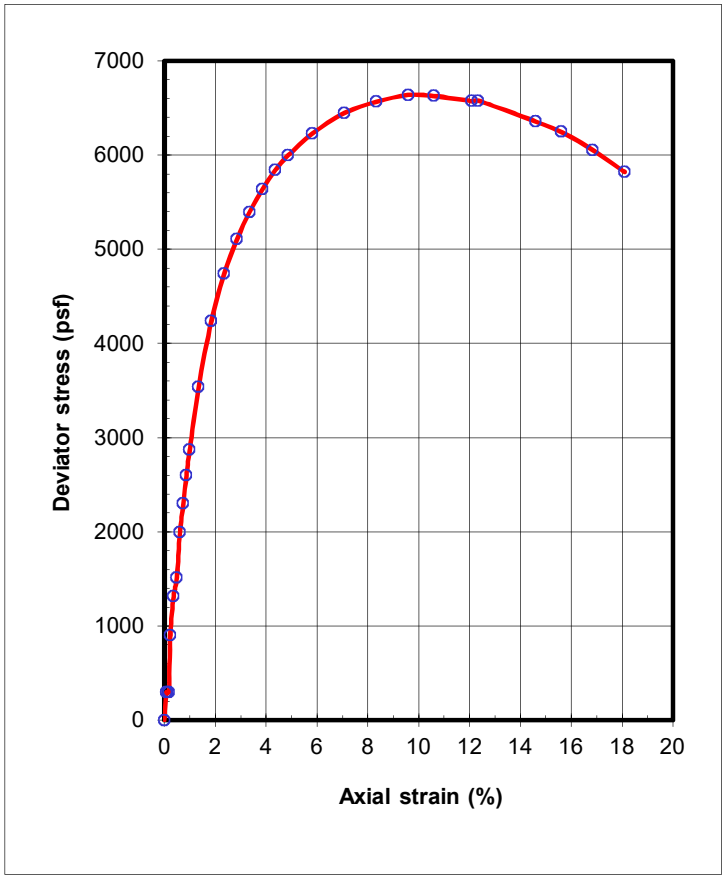
Data Reduction:

Dial factor = 1.0 in/unit
Load factor = 1.0 lb/unit

Specimen:
Total wt. = 909.7 gms
Ht. = 5.720 in
Ave dia. = 2.403 in
Area = 4.538 sq.in
Volume = 425.4 c.c.
Shearing rate = 0.04 inch/min
Shearing rate = 0.75 %/min
Gs (assumed) = 2.70

Test Report:
Void ratio = 0.500
Ht/Dia ratio = 2.38
Moisture = 18.8 %
Total density = 133.4 pcf
Dry density = 112.3 pcf
Saturation = 101.6 %
Chamber pressure = 2016 psf
Max. deviator stress = 6638 psf
Strain @ failure = 9.58 %

Dial Read.	Load Read.	Axial Strain (%)	Deviator Stress (psf)
-0.002		0.00	0.0
0.003	9.4	0.08	298.4
0.006	9.4	0.12	298.2
0.009	9.4	0.18	298.0
0.011	28.4	0.23	900.6
0.019	41.6	0.36	1314.7
0.026	48.0	0.49	1515.6
0.033	63.3	0.61	1994.8
0.041	73.0	0.74	2300.2
0.048	82.6	0.86	2598.6
0.055	91.4	0.99	2871.8
0.075	113.0	1.34	3535.9
0.104	136.1	1.85	4238.1
0.133	153.0	2.35	4741.3
0.162	165.7	2.85	5108.8
0.190	176.0	3.35	5396.3
0.219	184.7	3.86	5634.5
0.248	192.5	4.36	5842.6
0.277	198.7	4.87	5998.4
0.331	208.5	5.82	6229.5
0.403	218.7	7.07	6447.2
0.475	225.7	8.33	6565.2
0.547	231.4	9.58	6637.7
0.604	233.6	10.59	6628.1
0.690	235.7	12.09	6573.3
0.704	236.5	12.34	6578.4
0.833	234.6	14.60	6356.5
0.891	233.2	15.60	6246.3
0.962	229.5	16.85	6053.8
1.034	224.0	18.10	5820.9



UNCONSOLIDATED UNDRAINED COMPRESSION TEST - ASTM D2850

Client : ARUP/RYCG JV
Project : SFMTA Potrero
Job # : 260018-00 2018-001
Boring # BH-03
Sample # : 3-3B
Depth (ft) : 10-10.5
Date tested : 04/15/18
Soil : Yellowish brown bedrock

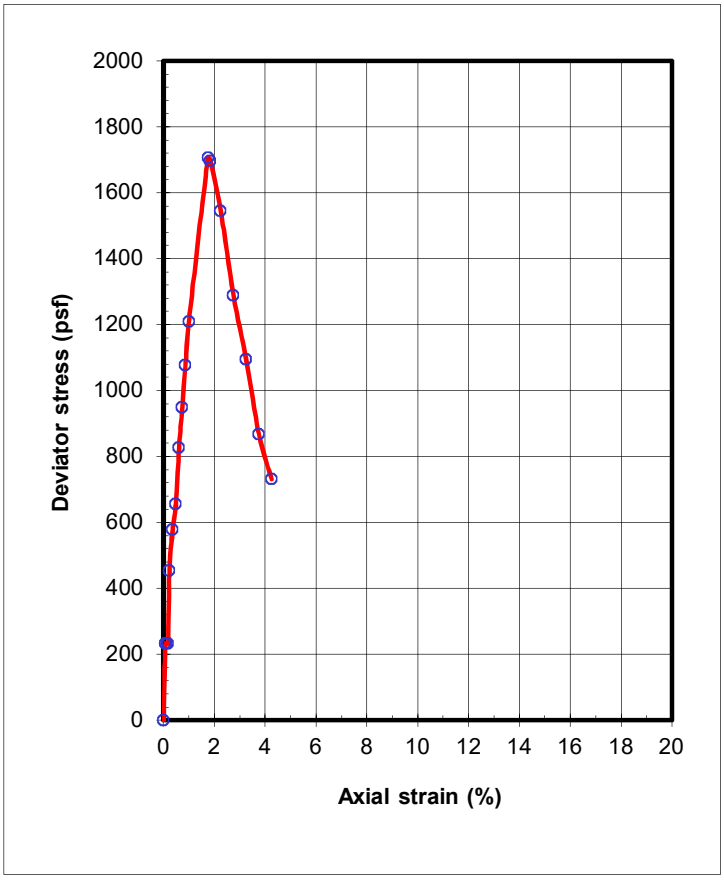
Data Reduction:

Dial factor = 1.0 in/unit
Load factor = 1.0 lb/unit

Specimen:
Total wt. = 705.5 gms
Ht. = 5.800 in
Ave dia. = 2.393 in
Area = 4.501 sq.in
Volume = 427.8 c.c.
Shearing rate = 0.03 inch/min
Shearing rate = 0.5 %/min
Gs (assumed) = 2.70

Test Report:
Void ratio = 1.223
Ht/Dia ratio = 2.42
Moisture = 35.8 %
Total density = 102.9 pcf
Dry density = 75.8 pcf
Saturation = 79.0 %
Chamber pressure = 1008 psf
Max. deviator stress = 1706 psf
Strain @ failure = 1.75 %

Dial Read.	Load Read.	Axial Strain (%)	Deviator Stress (psf)
-0.002		0.00	0.0
0.003	7.3	0.08	233.0
0.006	7.3	0.13	232.9
0.009	7.3	0.18	232.7
0.012	14.2	0.23	453.4
0.019	18.1	0.36	578.5
0.027	20.6	0.49	656.2
0.034	26.0	0.61	825.6
0.041	29.9	0.74	949.2
0.049	33.9	0.87	1076.5
0.056	38.2	1.00	1209.2
0.100	54.3	1.75	1705.9
0.106	54.0	1.85	1696.2
0.129	49.4	2.25	1545.6
0.158	41.4	2.75	1289.1
0.187	35.4	3.25	1094.4
0.216	28.2	3.75	867.8
0.245	23.9	4.25	731.3



INSPECTION SERVICES, INC. BERKELEY, CA

UNCONSOLIDATED UNDRAINED COMPRESSION TEST - ASTM D2850

Client : ARUP/RYCG JV
Project : SFMTA Potrero
Job # : 260018-00 2018-001
Boring # BH-06
Sample # : 6-5B
Depth (ft) : 20-20.5
Date tested : 04/15/18
Soil : Greenish gray sandy clay

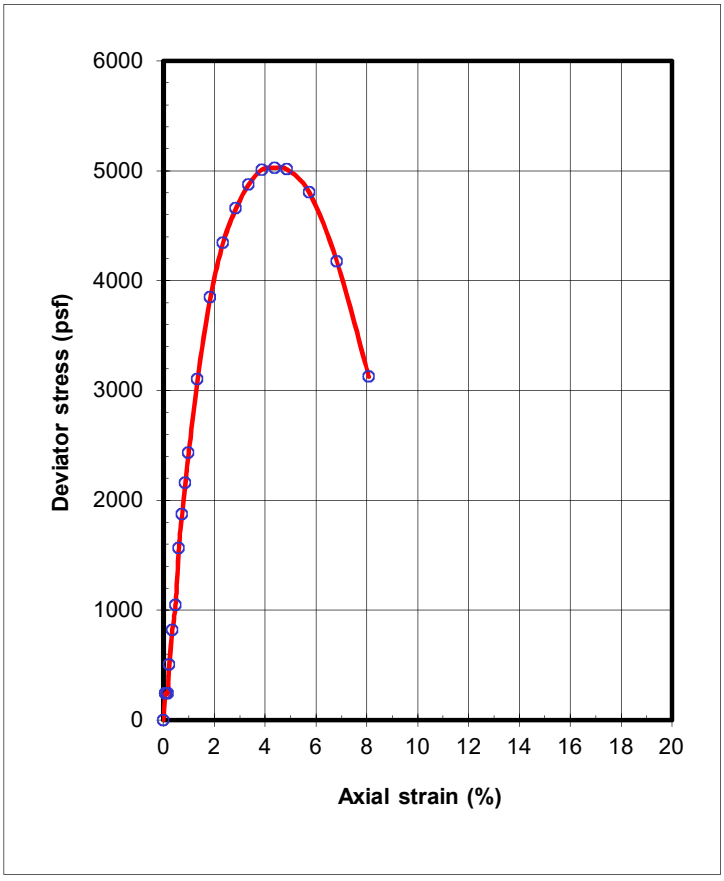
Data Reduction:

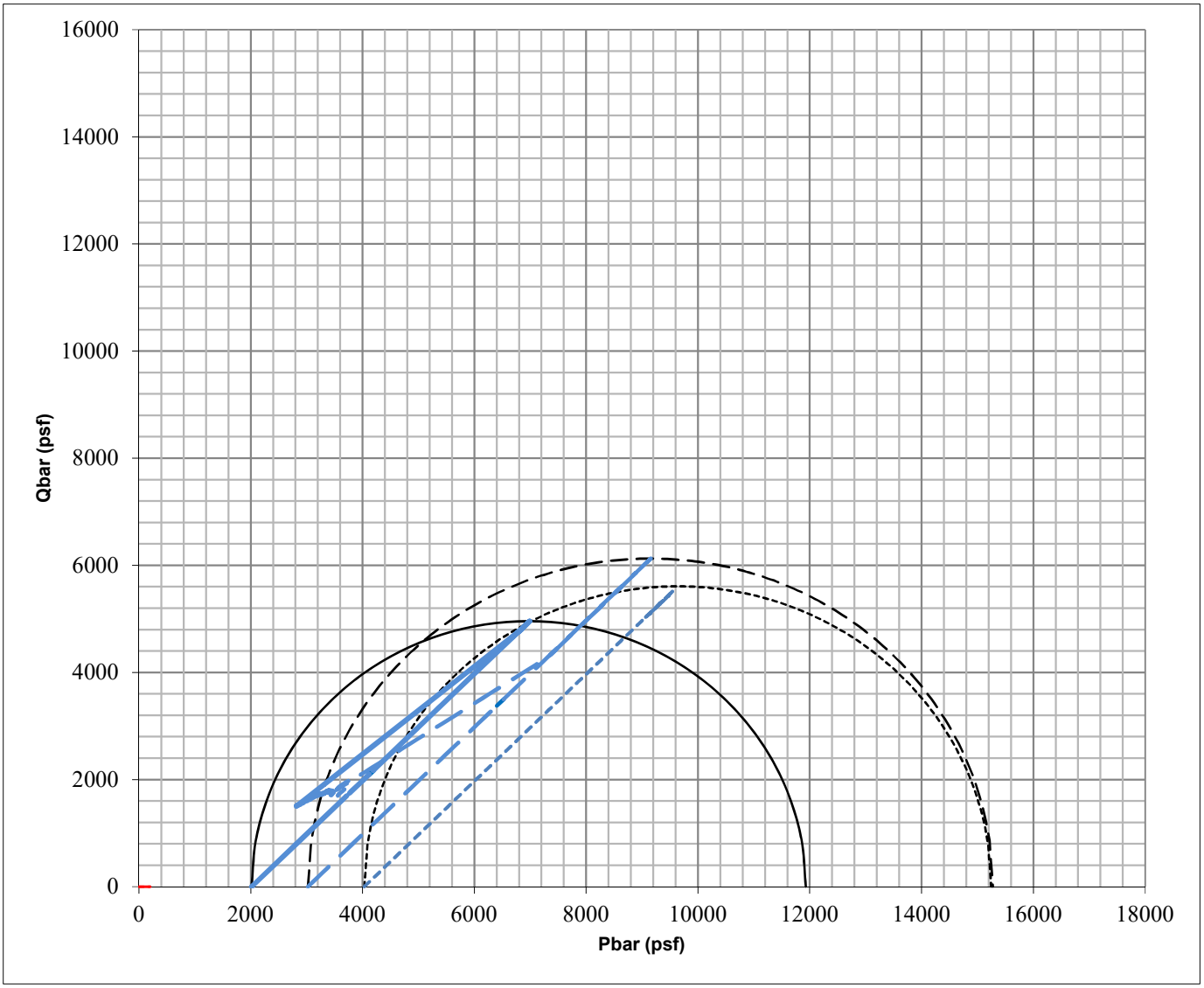
Dial factor = 1.0 in/unit
Load factor = 1.0 lb/unit

Specimen:
Total wt. = 888.1 gms
Ht. = 5.780 in
Ave dia. = 2.400 in
Area = 4.526 sq.in
Volume = 428.7 c.c.
Shearing rate = 0.04 inch/min
Shearing rate = 0.75 %/min
Gs (assumed) = 2.70

Test Report:
Void ratio = 0.581
Ht/Dia ratio = 2.41
Moisture = 21.3 %
Total density = 129.3 pcf
Dry density = 106.6 pcf
Saturation = 99.1 %
Chamber pressure = 2016 psf
Max. deviator stress = 5026 psf
Strain @ failure = 4.37 %

Dial Read.	Load Read.	Axial Strain (%)	Deviator Stress (psf)
-0.001		0.00	0.0
0.003	7.7	0.08	245.4
0.006	7.7	0.12	245.2
0.008	7.7	0.17	245.1
0.012	15.9	0.23	505.9
0.019	25.9	0.35	822.2
0.026	33.1	0.47	1047.8
0.034	49.5	0.61	1566.4
0.041	59.3	0.73	1874.4
0.048	68.4	0.86	2157.5
0.056	77.2	0.99	2432.8
0.076	98.9	1.34	3103.0
0.105	123.2	1.84	3846.7
0.134	139.9	2.34	4345.8
0.163	150.7	2.85	4657.8
0.192	158.5	3.36	4872.6
0.222	163.8	3.86	5009.5
0.251	165.2	4.37	5025.7
0.280	165.5	4.86	5010.9
0.330	160.2	5.73	4805.2
0.393	140.7	6.82	4172.0
0.465	106.9	8.08	3126.9





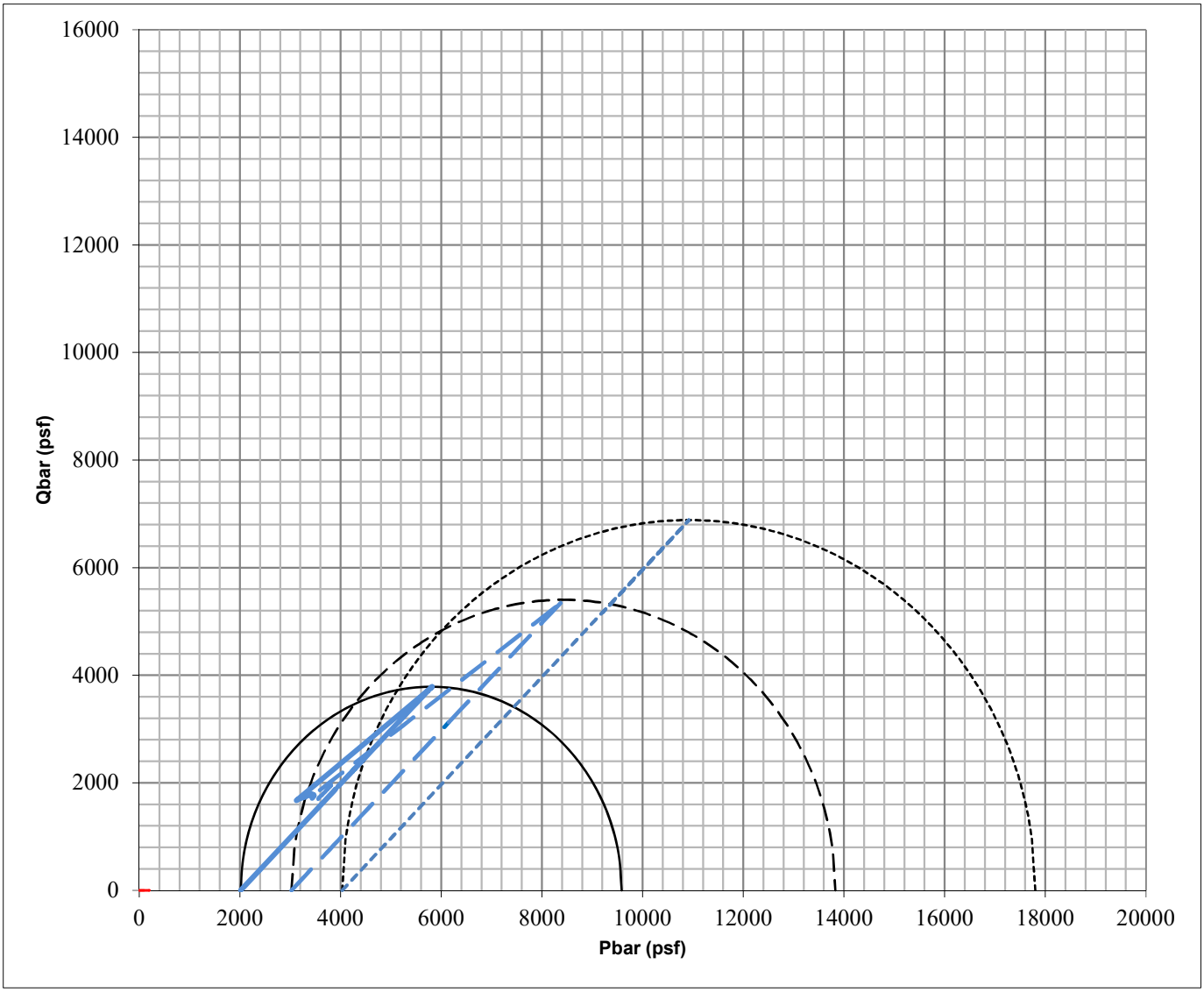
PQ MOHR GRAPH

Failure Criteria Maximum Effective σ1 / σ3 ratio

Line Type	Minor Principal Stress at failure (psf) σ_3	Maximum Deviator Stress at failure (psf)	Axial Strain at Failure (%)	Initial Height (in.)	Initial Diam. (in.)	Initial Moisture Content (%)	Initial Wet Density (pcf)	Initial Dry Density (pcf)	Initial Void Ratio	Initial Satura-tion (%)	Specific Gravity (assumed)	Rate of Strain (%/min)	Liquid Limit	Plastic Limit	Height to Diameter Ratio
solid	2016	9913	2.60	5.62	2.40	25.65	122.7	97.7	0.726	95.4	2.70	0.02			2.3
dash	3024	12252	1.80	5.62	2.43	25.65	119.5	95.1	0.772	89.7	2.70	0.02			2.3
dot	4032	11215	19.75	5.62	2.46	25.65	117.0	93.1	0.810	85.5	2.70	0.02			2.3

Client:	**ARUP/RYCG JV**	Boring #:	**BH-01**	Sample #: **1-7B**
Project:	**SFMTA Potrero**	Depth (ft):	**31-31.5**	
Project #:	**260018-00 2018-001**	Soil:	**Brown sand**	

ASTM D-4767	**STAGED TRIAXIAL COMPRESSION CONSOLIDATED-DRAINED**	**TXCD**



PQ MOHR GRAPH

Failure Criteria Maximum Effective σ1 / σ3 ratio

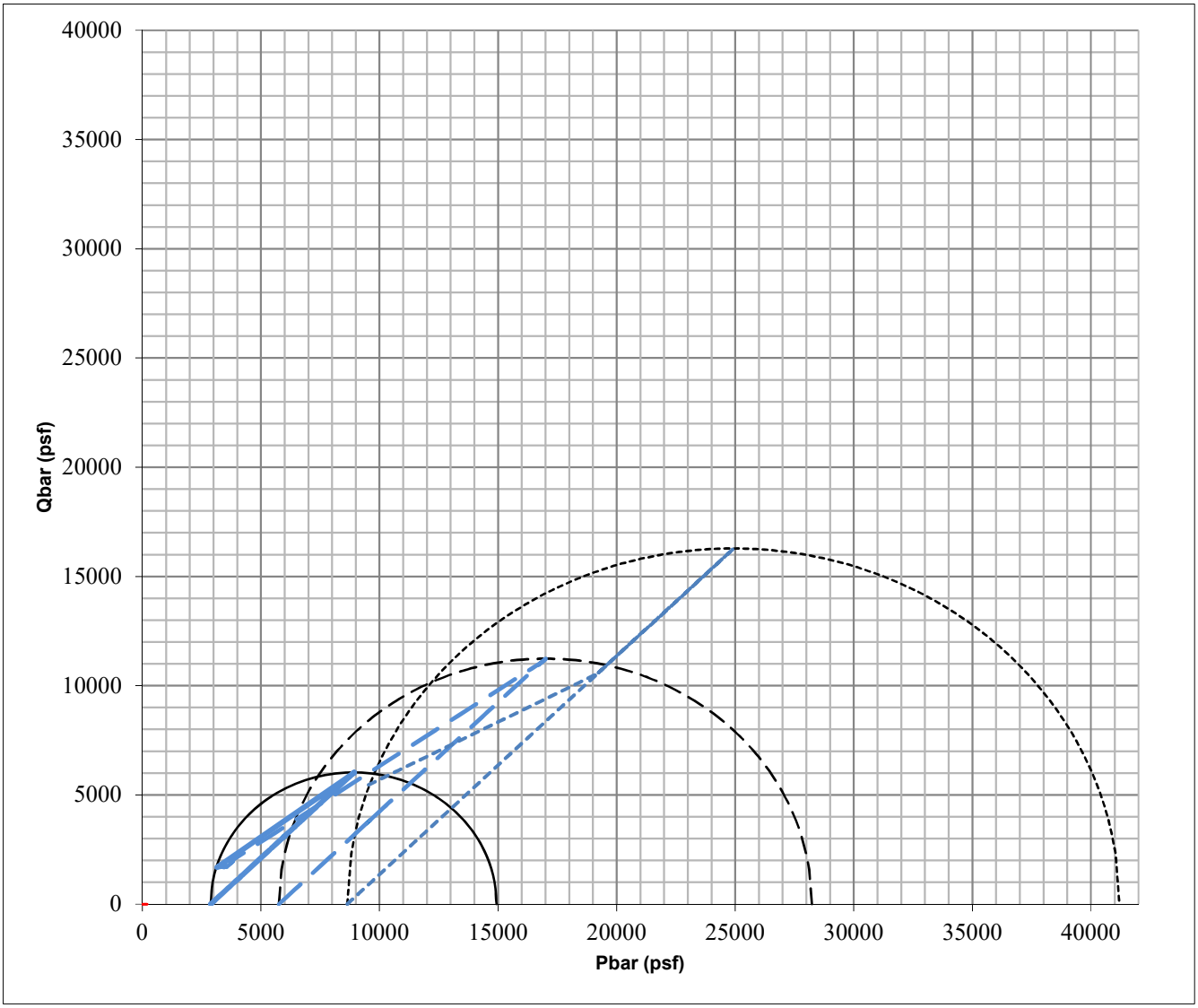
Line Type	Minor Principal Stress at failure (psf) σ_3	Maximum Deviator Stress at failure (psf)	Axial Strain at Failure (%)	Initial Height (in.)	Initial Diam. (in.)	Initial Moisture Content (%)	Initial Wet Density (pcf)	Initial Dry Density (pcf)	Initial Void Ratio	Initial Satura-tion (%)	Specific Gravity (assumed)	Rate of Strain (%/min)	Liquid Limit	Plastic Limit	Height to Diameter Ratio
solid	2016	7568	4.10	5.62	2.40	22.59	129.7	105.8	0.593	102.8	2.70	0.02			2.3
dash	3024	10805	2.60	5.62	2.45	22.59	124.3	101.4	0.662	92.1	2.70	0.02			2.3
dot	4032	13768	2.40	5.62	2.48	22.59	121.3	98.9	0.703	86.7	2.70	0.02			2.3

Client:	**ARUP/RYCG JV**	Boring #:	**BH-02**	Sample #:	**2-8B**
Project:	**SFMTA Potrero**	Depth (ft):	**36-36.5**		
Project #:	**260018-00 2018-001**	Soil:	**Brown sand**		

ASTM D-4767	**STAGED TRIAXIAL COMPRESSION CONSOLIDATED-DRAINED**	**TXCD**

Inspection Services Inc.

PLATE NUMBER_____



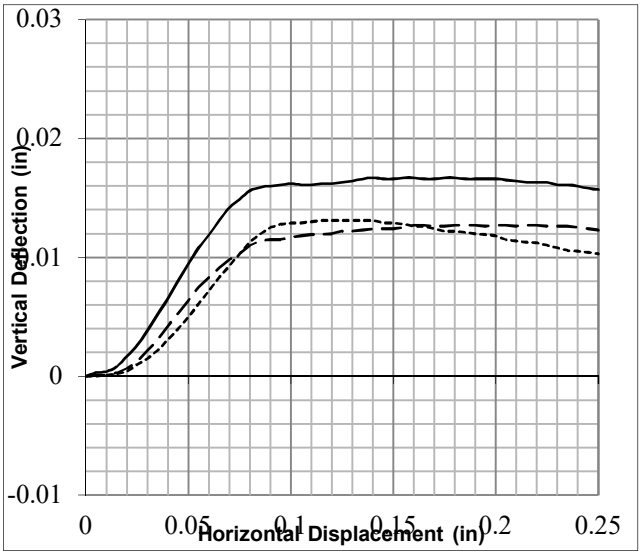
PQ MOHR GRAPH

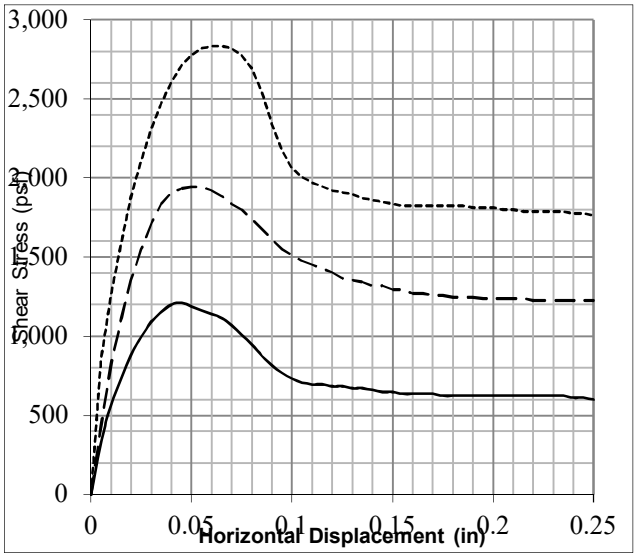
Failure Criteria Maximum Effective σ1 / σ3 ratio

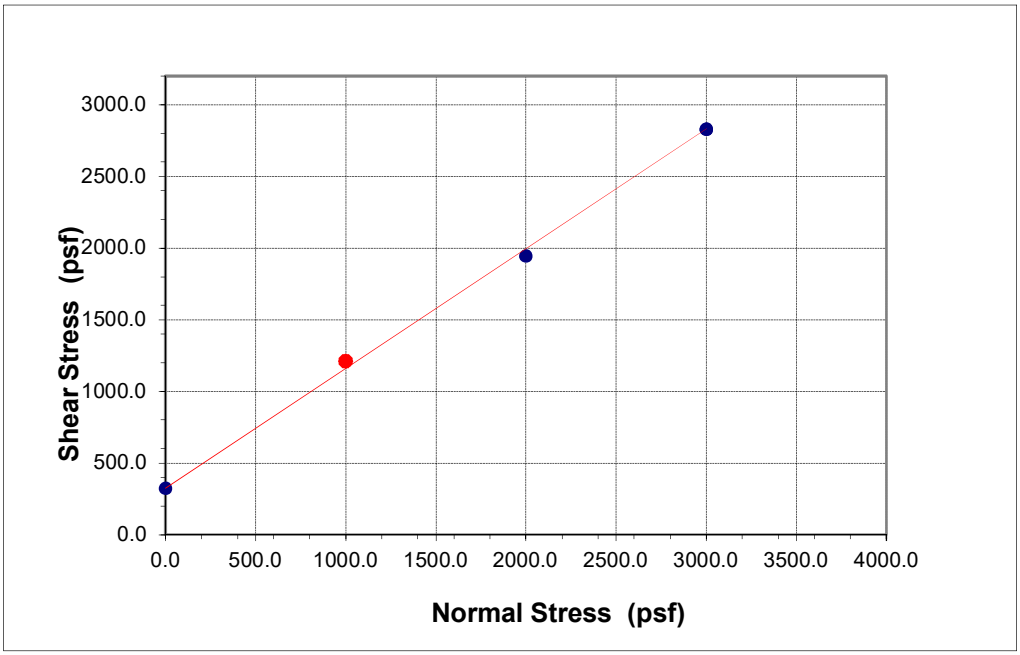
Line Type	Minor Principal Stress at failure (psf) σ_3	Maximum Deviator Stress at failure (psf)	Axial Strain at Failure (%)	Initial Height (in.)	Initial Diam. (in.)	Initial Moisture Content (%)	Initial Wet Density (pcf)	Initial Dry Density (pcf)	Initial Void Ratio	Initial Satura-tion (%)	Specific Gravity (assumed)	Rate of Strain (%/min)	Liquid Limit	Plastic Limit	Height to Diameter Ratio
solid	2880	12055	4.60	5.75	2.40	17.86	134.8	114.4	0.473	101.8	2.70	0.02			2.4
dash	5760	22472	4.10	5.75	2.43	17.86	131.8	111.8	0.507	95.0	2.70	0.02			2.4
dot	8640	32559	3.80	5.75	2.46	17.86	129.0	109.5	0.540	89.3	2.70	0.02			2.3

Client:	**ARUP/RYCG JV**	Boring #:	**BH-02**	Sample #:	**2-11**
Project:	**SFMTA Potrero**	Depth (ft):	**57-57.5**		
Project #:	**260018-00 2018-001**	Soil:	**Brown silty sand**		

ASTM D-4767	**STAGED TRIAXIAL COMPRESSION CONSOLIDATED-DRAINED**	**TXCD**







Legend

Test 1
Test 2
Test 3

Results

C = 325 psf
phi = 40 deg.

Gs = 2.70
Type = undisturbed

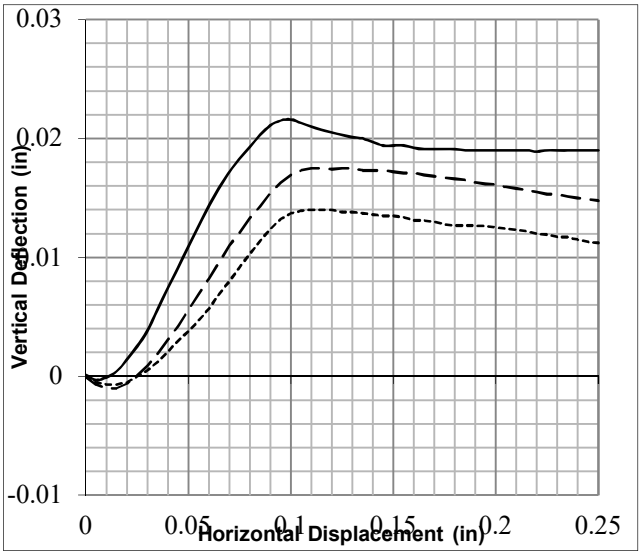
Test no.	SigN psf	Peak Shear str., psf	Displ. in.	Strain Rate in./hr	Initial MC %	Initial DD pcf	Initial Sat. %	Initial Void Ratio	Initial Ht. in.	Initial Dia. in.	Final MC %	Final DD pcf	Final Sat. %	Final Void Ratio	Final Ht. in.
1	1000	1212	0.045	0.09	14.0	116.8	86	0.443	1.00	2.416	15.7	117.1	97	0.439	0.998
2	2000	1944	0.050	0.09	14.7	116.6	89	0.446	1.00	2.416	16.2	112.2	87	0.502	1.039
3	3000	2832	0.060	0.09	15.6	116.1	93	0.451	1.00	2.416	16.3	111.4	86	0.513	1.043

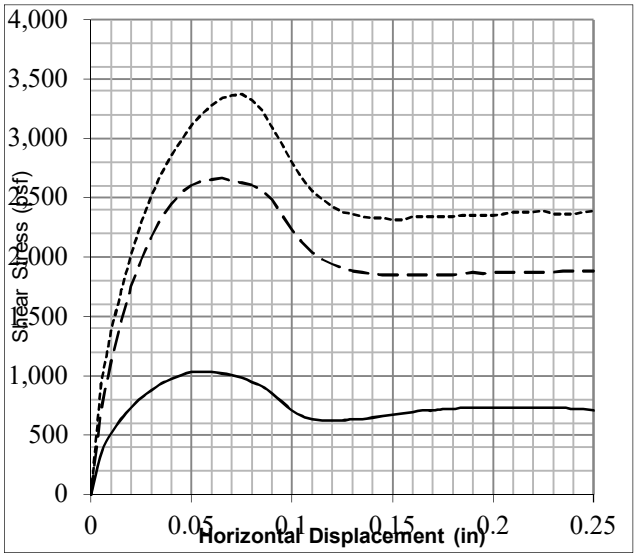
Client: ARUP/RYCG JV | **Boring #:** BH-01 | **Sample #:** 1-3B

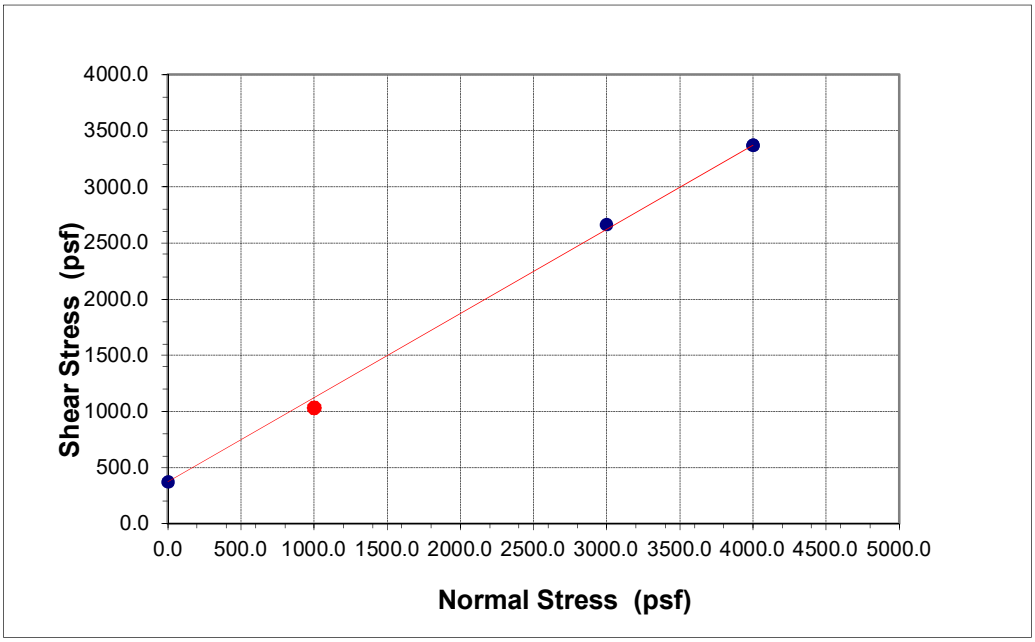
Project: SFMTA Potrero | **Depth(ft)** 11-11.5

Project #: **260018-00 2018-001** | Soil: **Undisturbed brown clayey sand**

TEST REPORT: **Direct shear - inundated, consolidated, & drained test**







Legend

_____ Test 1

_ _ _ _ _ Test 2

..... Test 3

Results

C = 375 psf

phi = 37 deg.

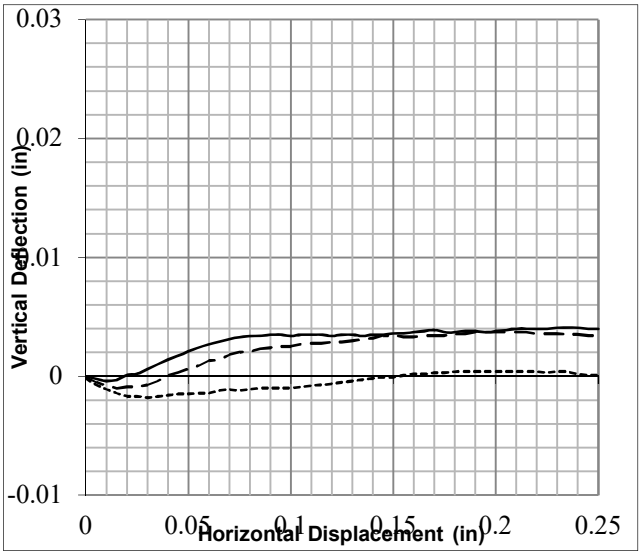
Gs = 2.70

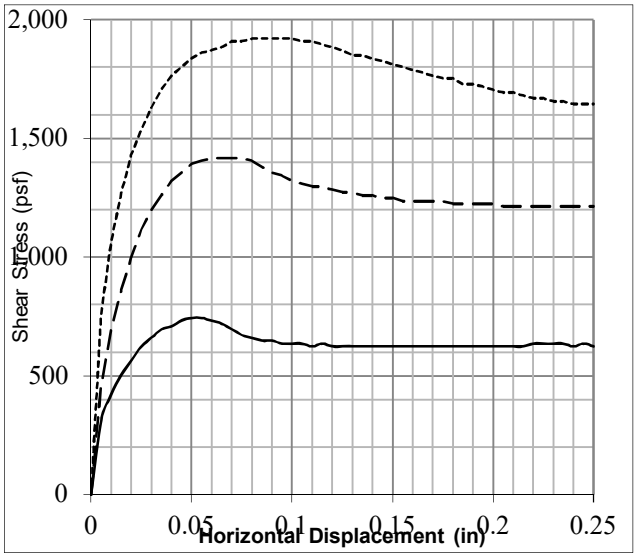
Type = undisturbed

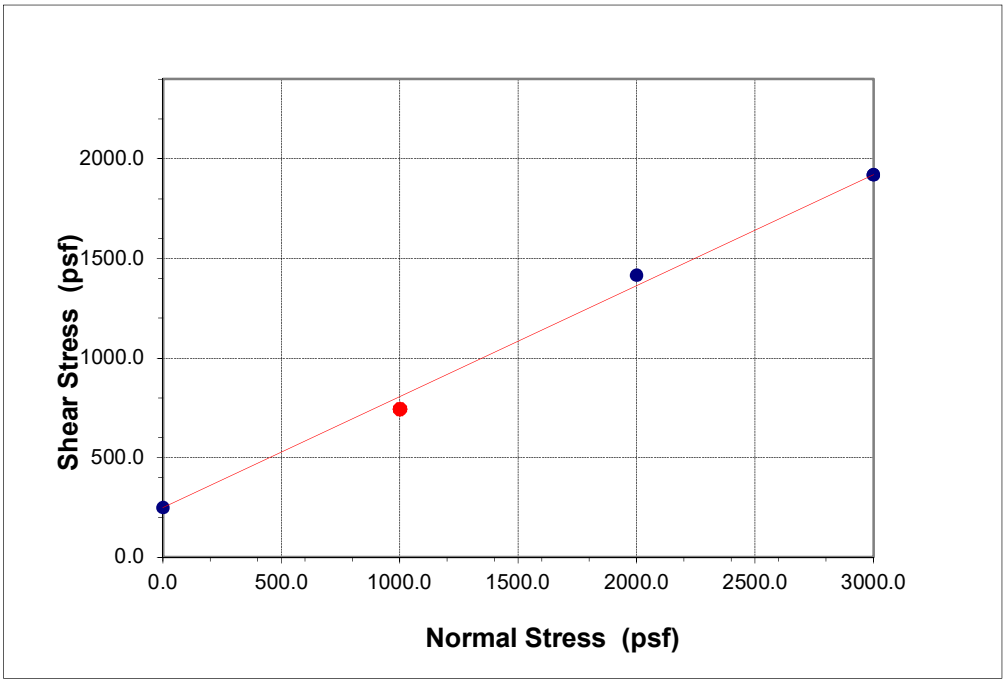
Test no.	SigN psf	Peak Shear str., psf	Displ. in.	Strain Rate in./hr	Initial MC %	Initial DD pcf	Initial Sat. %	Initial Void Ratio	Initial Ht. in.	Initial Dia. in.	Final MC %	Final DD pcf	Final Sat. %	Final Void Ratio	Final Ht. in.
1	1000	1032	0.050	0.09	17.7	105.9	81	0.592	1.00	2.416	18.1	102.5	76	0.645	1.033
2	3000	2664	0.065	0.09	18.3	104.8	81	0.609	1.00	2.416	19.3	101.8	80	0.655	1.029
3	4000	3372	0.075	0.09	18.2	104.0	79	0.621	1.00	2.416	18.7	105.3	84	0.601	0.988

Client: **ARUP/RYCG JV**	**Boring #:** **BH-02**	**Sample #:** **2-9B**
Project: **SFMTA Potrero**		**DEPTH(ft): 41-41.5**
Project #: **260018-00 2018-001**	Soil: **Undisturbed brown sand**	

TEST REPORT: **Direct shear - inundated, consolidated, & drained test**







Legend

Test 1
Test 2
Test 3

Results

C = 250 psf
phi = 29 deg.

Gs = 2.70
Type = undisturbed

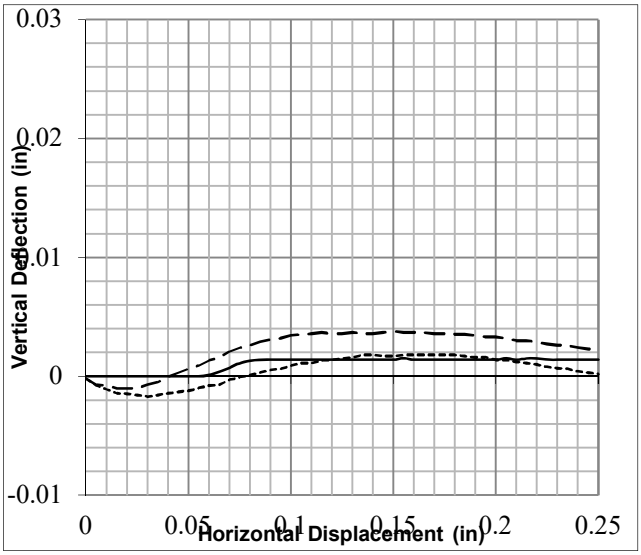
Test no.	SigN psf	Peak Shear str., psf	Displ. in.	Strain Rate in./hr	Initial MC %	Initial DD pcf	Initial Sat. %	Initial Void Ratio	Initial Ht. in.	Initial Dia. in.	Final MC %	Final DD pcf	Final Sat. %	Final Void Ratio	Final Ht. in.
1	1000	744	0.050	0.09	15.4	111.7	82	0.509	1.00	2.416	15.8	109.8	80	0.535	1.017
2	2000	1416	0.060	0.09	17.4	110.3	89	0.529	1.00	2.416	17.3	107.5	82	0.568	1.026
3	3000	1920	0.080	0.09	19.9	106.3	92	0.585	1.00	2.416	19.9	108.6	97	0.552	0.979

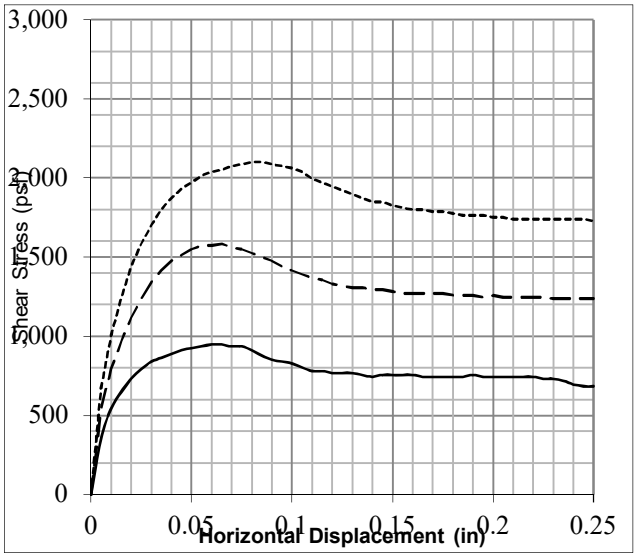
Client: **ARUP/RYCG JV** **Boring #:** **BH-04** **Sample #:** **4-4B**

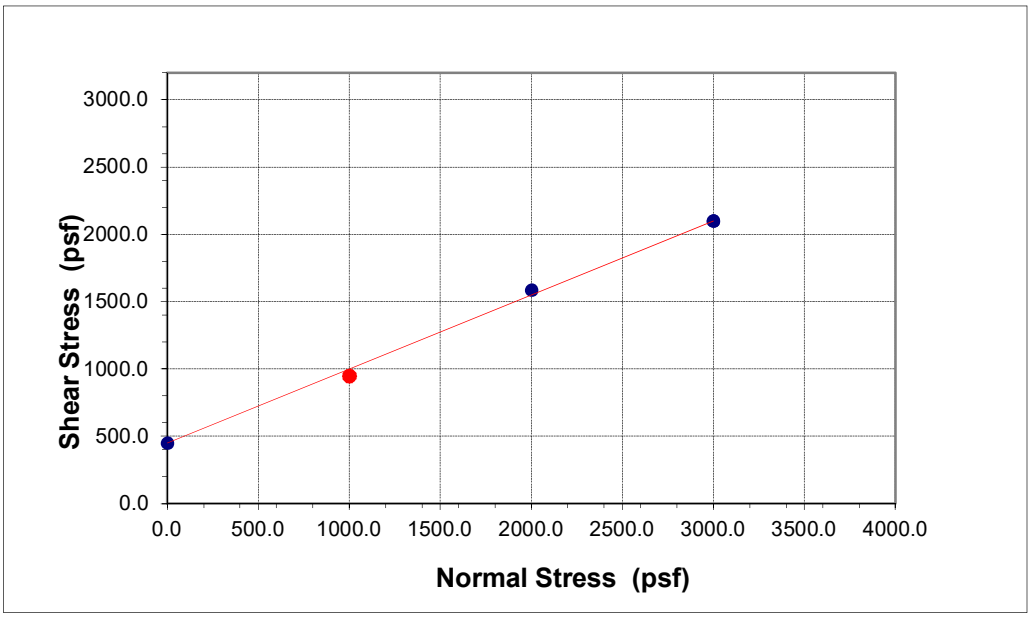
Project: **SFMTA Potrero** **Depth(ft) 15-15.5**

Project #: **260018-00 2018-001** Soil: **Undisturbed reddish brown clayey sand**

TEST REPORT: **Direct shear - inundated, consolidated, & drained test**







Legend

Test 1
Test 2
Test 3

Results

C = 450 psf
phi = 29 deg.

Gs = 2.70
Type = undisturbed

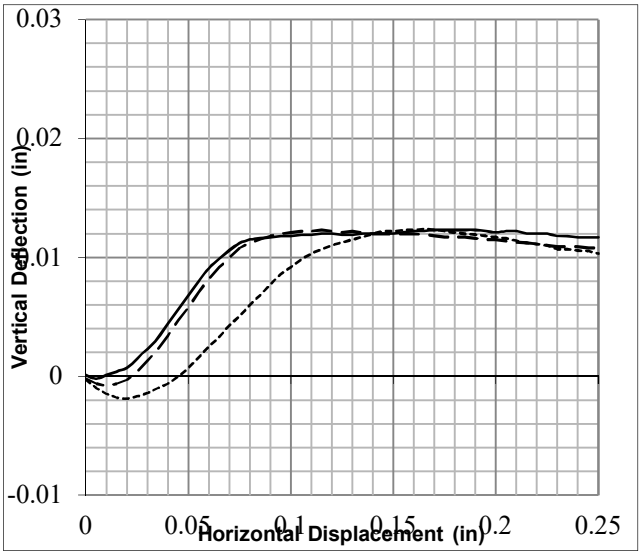
Test no.	SigN psf	Peak Shear str., psf	Displ. in.	Strain Rate in./hr	Initial MC %	Initial DD pcf	Initial Sat. %	Initial Void Ratio	Initial Ht. in.	Initial Dia. in.	Final MC %	Final DD pcf	Final Sat. %	Final Void Ratio	Final Ht. in.
1	1000	948	0.060	0.09	19.8	106.9	93	0.577	1.00	2.416	20.1	108.1	97	0.559	0.989
2	2000	1584	0.065	0.09	20.0	107.1	94	0.574	1.00	2.416	20.3	105.0	91	0.605	1.020
3	3000	2100	0.080	0.09	20.5	105.6	93	0.597	1.00	2.416	19.9	103.1	85	0.634	1.024

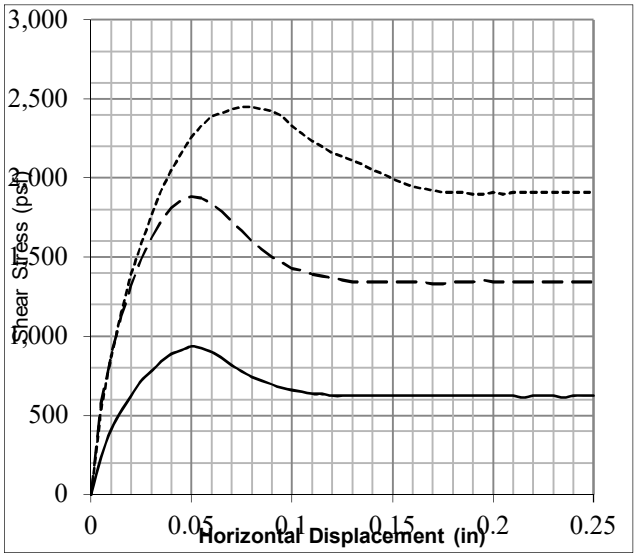
Client: **ARUP/RYCGJV**	**Boring #:** **BH-04**	**Sample #:** **4-5B**
Project: **SFMTA Potrero**		**Depth(ft): 20-20.5**
Project #: **260018-00 2018-001**	Soil: **Undisturbed reddish brown clayey sand**	

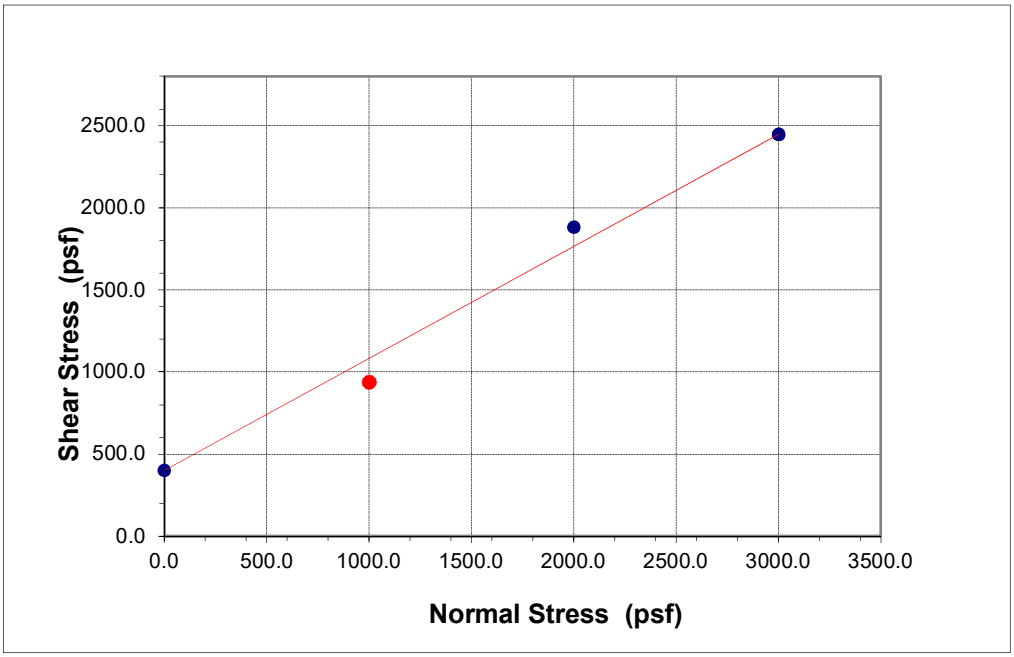
TEST REPORT: **Direct shear - inundated, consolidated, & drained test**

Inspection Services Inc.

Plate no: _____







Legend

_____ Test 1

_ _ _ _ _ Test 2

..... Test 3

Results

C = 400 psf

phi = 34 deg.

Gs = 2.70

Type = undisturbed

Test no.	SigN psf	Peak Shear str., psf	Displ. in.	Strain Rate in./hr	Initial MC %	Initial DD pcf	Initial Sat. %	Initial Void Ratio	Initial Ht. in.	Initial Dia. in.	Final MC %	Final DD pcf	Final Sat. %	Final Void Ratio	Final Ht. in.
1	1000	936	0.050	0.09	19.5	105.1	87	0.603	1.00	2.416	19.7	105.7	89	0.595	0.995
2	2000	1884	0.050	0.09	19.6	105.5	89	0.597	1.00	2.416	20.2	102.0	83	0.653	1.035
3	3000	2448	0.075	0.09	19.7	104.1	86	0.619	1.00	2.416	20.0	100.8	80	0.672	1.033

Client: **ARUP/RYCG JV** **Boring #:** **BH-06** **Sample #:** **6-4B**

Project: **SFMTA Potrero** **Depth(ft): 15-15.5**

Project #: **260018-00 2018-001** Soil: **Undisturbed brown clayey sand**

TEST REPORT: **Direct shear - inundated, consolidated, & drained test**

DISTRIBUTION

Electronic copy: Plenary Americas
555 W. Fifth Street, Suite 3150
Los Angeles, California 9001

Division 4: Supplemental Design Criteria

POTRERO YARD MODERNIZATION PROJECT

Exhibit 18:
Technical Requirements

Division 04:
Supplemental Design Criteria
PDA Appendix E: Technical Requirements

November 06, 2024

FINAL DRAFT

TABLE OF CONTENTS

Introduction

This Division 4 sets forth supplemental design criteria for the Project. These supplemental design criteria shall apply together with other design criteria and requirements set forth in the Technical Requirements.

As described in Division 1 and elsewhere in the Technical Requirements, the Project must fully enable the design, construction, operations and maintenance of either Joint Development Alternative. While complying with these requirements, the Principal Project Company shall demonstrate how possible noise, vibration, or seismic impacts to each Joint Development Alternative are taken into account and mitigated.

1 Supplemental Noise and Vibration Requirements

The Principal Project Company shall comply with these supplemental noise and vibration requirements in the design of the Project..

1.1 Intent of these Supplemental Noise and Vibration Requirements

Principal Project Company shall demonstrate through engineering analysis that the Project's design will comply with the applicable noise and vibration requirements included in this Division 4 and Division 3.

Engineering analysis refers to industry-standard or project-specific approaches (with technical back-up) that present the basis and results of airborne source-path-receiver calculations (and the same for structure-borne noise and vibration transmission where noted to be required), along with uncertainty estimation.

These supplemental noise and vibration requirements establish:

1. Project criteria for noise and vibration; and
2. Deliverable requirements for the noise and vibration scope.

The criteria for noise and vibration are established in the following categories:

Environmental Noise	Includes all systems and operations, which shall be designed to comply with outdoor noise restrictions governed by applicable Laws.
MEP Systems Noise and Vibration	Includes: mechanical, HVAC, electrical, plumbing, vertical transportation, power generation and back-up systems, window cleaning and building maintenance systems, and other specialty systems that may generate noise or vibration.

Building Envelope Sound Isolation / CalGreen	Includes sound isolation performance of the building façade and the remainder of the Infrastructure Facility building envelope, which shall comply with these supplemental noise and vibration requirements.
Acoustic Separation of Spaces	Includes airborne sound transmission performance of demising constructions separating adjacent spaces. Composite calculations are required for constructions with multi-component floor/ceiling and partition/ door/ window systems. This includes estimation of flanking paths from ductwork, cable-passes and shaft-ways, and project-specific architectural detailing.
Interior Room Acoustics	Includes project requirements for interior room acoustics such as reverberation time and/or occupational noise levels to support the intended programmatic usage of spaces.
Structure-borne Vibration	This category specifically pertains to the transmission of structure-borne noise and vibration from the Project systems and operations (primarily, but not exclusively, from bus operations and maintenance equipment that are part of the Bus Yard Component) to other areas.

1.2 Acoustic Consultant Qualifications

Principal Project Company shall, through Substantial Completion, engage the services of a qualified, independent acoustics and vibration consulting firm ("acoustic consultant") with a minimum of 10 years of relevant acoustics and vibration consulting experience with projects of type and complexity similar to the Project. The acoustics consultant shall have proven and demonstrated capabilities (as demonstrated by a minimum of three projects) both in predictive analysis of structure-borne vibration transmission and re-radiated noise in buildings. The acoustic consultant shall also have related experience in site testing and commissioning.

1.3 Applicable Codes and Standards

The latest published editions of the following codes and standards are referenced herein and made part of these supplemental noise and vibration requirements.

1. San Francisco Police Code Article 29
2. California Green Building Standards Code, Ch 5, CALGreen
3. California Uniform Building Code Title 24, with particular attention to Ch 12, Section 1206 Sound Transmission
4. International Building Code (IBC) Section 1206
5. International Code Council (ICC) G2-2010 Guidelines for Acoustics
6. If applicable: U.S. Department of Housing and Urban Development (HUD) regulation 24 CFR Part 51, Sub-part B
7. ASHRAE, American Society of Heating, Refrigerating and Air Conditioning Engineers, Fundamentals Handbook
8. NFPA 72

9. ISO 2631
10. 2018 FTA "Transit Noise and Vibration Impact Assessment Manual"

1.4 Acoustics, Noise, and Vibration Criteria

Acoustics, noise, and vibration criteria for the Project are listed below. Principal Project Company confirms that design concepts and strategies it develops for the Project will meet these criteria.

For any space type not listed or specified, criteria shall be proposed by the acoustics consultant for the City's review and approval.

1.4.1 Environmental Noise

Design noise emissions from the Project to comply with the noise ordinance and requirements of San Francisco Police Code Article 29.

Limit noise emissions from the Project equipment or operations at the Project Site to no more than 55 dBA Leq, 5min for outdoor areas frequented by people. Such areas include the grounds surrounding the Project Site, including any outdoor courtyards, break areas, and other areas where people congregate or hold meetings.

Consider all non-transportation sound sources from the Project and their impact on existing and future, nearby residential properties. Non-transportation sound sources include locations of loading docks, and outdoor services docks, if any.

1.4.2 Background Noise Criteria from MEP Systems

Designs for mechanical, electrical, and plumbing (MEP) building-system shall comply with the background noise criteria, as defined per occupancy type in the latest published edition of the ASHRAE Fundamentals Handbook.

Designs for occupied spaces shall comply with ASHRAE criteria for background noise level and shall exceed a noise level of NC 50. This is the highest recommended level that still allows for occupants to speak relatively comfortably without raising their voices.

Ductwork velocities shall comply with ASHRAE Fundamentals Handbook Chapter 49, 2019 edition, per room noise criteria.

For spaces that do not require speech communication and are unoccupied but require occasional occupancy (e.g., monitoring, maintenance, etc.), design the MEP systems must for a background noise level below 85 dBA in each space, to comply with the lower action limit for OSHA requirements to protect worker noise exposure.

Conduct engineering analysis for background noise level calculations in octave bands or one-third octave bands from 63 Hz to 4000 Hz spectra for each occupied space, inclusive of all system parameters including fan noise, flow-generated noise, self-generated noise of silencers, noise due to terminals, dampers, diffusers, duct breakout, radiated through partitions, structure-borne, and duct-borne noise.

Conduct a 31.5 Hz octave band analysis if there is a reasonable basis to expect high noise levels from very low frequency sources,

Occupied spaces in the Project shall be free of pure tones. A pure tone is defined as an amplitude at any 1/3-octave band center frequency that is 5dB or more above the amplitude of adjacent bands. Manufacturer's data sheets for MEP equipment shall be assessed by the acoustic consultant to confirm that equipment exhibiting pure tones is not selected.

Emergency generators and similar stand-by equipment such as smoke exhaust or stair pressurization fans shall be designed with noise and vibration control to meet the requirements of applicable local noise ordinance(s) and to limit disturbance to Project occupants during maintenance or testing, including the noise associated with any temporary load banks or load application systems.

Noise levels generated by emergency and stand-by systems shall also be considered in the analysis of emergency evacuation or paging systems that require intelligibility. NFPA-72 shall be referred to for guidance on intelligibility requirements for such systems design.

1.4.3 MEP Systems Vibrations Isolation

Vibration isolation of equipment and any associated piping, as well as structural stiffness and deflection requirements of structures supporting MEP equipment shall comply with requirements in ASHRAE Fundamentals Handbook Chapter 49, 2019 edition.

1.4.4 Building Envelope Sound Isolation

The Project's façade and building envelope shall comply with the requirements of California Green Building Standards Code, Ch 5, CALGreen and California Uniform Building Code Title 24, with particular attention to Ch 12, Section 1206 *Sound Transmission*.

1.4.5 Acoustic Separation of Spaces and Interior Room Acoustics

Supplemental noise and vibration requirements include the 2019 California Uniform Building Code (section 1206) and 2020 California Residential Building Code (Title 24, Part 2.5, section AK102-103) for indoor sound separation, noting that these are currently in line with IBC.

Requirements for acoustic separation between demising spaces shall meet minimum standards for Class A office space in San Francisco. This includes, at minimum:

1. Open plan workspace "normal" speech privacy
    a. background Noise: NC 40 maximum
    b. electronic sound masking: 40 to 45 dBA if background noise levels are calculated to be less than NC-35 on average.
    c. Sound absorbing ceiling of NRC 0.70 Minimum (ASTM C423, Type E-400 mounting)
2. Offices and meeting rooms "normal" speech privacy
    a. background noise: NC 35 maximum

b. minimum noise reduction of partitions: NIC 35 Minimum with sound masking and NIC 40 minimum without sound masking (noise isolation class defined per ASTM E336)

c. sound absorbing ceiling of NRC 0.80 minimum (ASTM C423, Type E-400 mounting)

d. sound absorbing wall panels on 25% of walls of NRC 0.70 minimum (ASTM C423, type-A mounting)

3. Private offices and meeting rooms "confidential" speech privacy

   a. background noise: NC 30 maximum

   b. noise reduction of partitions: NIC 45 minimum

   c. provide absorption of NRC 0.80 minimum on 25% of walls

For purposes of evaluating impacts to Joint Development Alternative 1, Principal Project Company shall assume the following are residential acoustic design requirements: the International Building Code and "Average" rating or greater under the U.S. Department of Housing and Urban Development Guide.

1.4.6 Project Vibration Criteria

Noise and vibration impacts from the operations and maintenance activities in the Infrastructure Facility shall not adversely impact any Joint Development Alternative. Vibration control systems shall be provided for all Infrastructure Facility operations and maintenance activities (including vehicle idling, vehicle movements over surface discontinuities, vehicle lifts and conveyance, tools, testing and other processes that occur within the yard), as well as all Project building systems (architectural and /or structural), such that maximum mid-span floor vibration levels shall not exceed recommended criteria for residential dwellings contained in the following two references:

1. ISO 2631 (part 1 and part 2) provides "base curves" for maximum allowable vibration in all 3 axes. For nighttime residential applications, Annex A requires no more than 1.4x the base curve. ISO requirements for steady state, transient vibration and "shock" shall be used based on the type of activity analyzed.
2. The US industry standard is the 2018 FTA "Transit Noise and Vibration Impact Assessment Manual". See Table 6-3 below. Applicable criteria are outlined in red, as applicable to elevated residential floors of this Project.

Table 6-3 Indoor Ground-Borne Vibration (GBV) and Ground-Borne Noise (GBN) Impact Criteria for General Vibration Assessment

Land Use Category	GBV Impact Levels (VdB re 1 micro-inch /sec)			GBN Impact Levels (dBA re 20 micro Pascals)		
	Frequent Events	Occasional Events	Infrequent Events	Frequent Events	Occasional Events	Infrequent Events
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB[*]	65 VdB[*]	65 VdB[*]	N/A[**]	N/A[**]	N/A[**]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

1.5 Proprietary Design Deliverables

In addition to the requirements in Division 1, Section 1.8.5, the following sections describe the Design Deliverables required at each stage of the design specified in Division 1, Section 1.8.5.2.

1.5.1 50% Design Development

Principal Project Company shall prepare and submit the following in the 50% Design Development package:

1. Acoustic criteria per program space. Identify acoustically sensitive spaces.
2. Demonstrate compliance with acoustic criteria, including:
    a. Background noise calculations for acoustically-sensitive program space types, providing proof of design compliance.
    b. Verify compliance with prescriptive sound isolation and room acoustics criteria for acoustically-sensitive spaces.
3. Register of risks and critical path items in the Project design related to achievement of acoustic criteria, including recommendations for resolution of the same.
4. Detailed engineering analysis that meets the requirements of Section 1.7 (Special Commentary on Required Engineering Analysis) and demonstrates full compliance with vibration and structure-borne noise criteria.
5. Coordinated design to meet acoustics, noise, and vibration criteria with all related disciplines (architectural, structural, mechanical, etc.).

All noise control specifications that relate to these noise calculations shall be included in the written specifications for mechanical vibration and seismic control provided in a schedule in the Design Documents.

1.5.2 100% Design Development

Principal Project Company shall prepare and submit the following in the 100% Design Development package:

1. Updates to acoustic criteria per program space, identifying changes from the prior design deliverable.
2. Demonstrate compliance with acoustic criteria, including:
    a. Background noise calculations for each program space type, providing proof of design compliance.
    b. Sound isolation and room acoustics proof of design compliance for each category of acoustic privacy.
3. Register of risks and critical path items in the Project design related to airborne noise, including recommendations for resolution of the same.

4. Updates, if any, to detailed engineering analysis that meets the requirements of Section 1.7 (Special Commentary on Required Engineering Analysis) and demonstrates full compliance with vibration and structure-borne noise criteria.
5. Coordinated design to meet acoustics, noise, and vibration criteria with all related disciplines (architectural, structural, mechanical, etc.).

All noise control specifications that relate to these noise calculations shall be included in the written specifications for mechanical vibration and seismic control provided in a schedule in the Design Documents.

1.5.3 50% Construction Documents

Principal Project Company shall prepare and submit the following in the 50% Construction Documents package:

1. Updates to acoustic criteria per program space, identifying changes from the prior design deliverable.
2. Proof of design compliance and detailed calculations, as necessary, with an executive summary that demonstrate compliance with airborne noise acoustic criteria.
3. Updates, if any, to detailed engineering analysis that meets the requirements of Section 1.7 (Special Commentary on Required Engineering Analysis) and demonstrates full compliance with vibration and structure-borne noise criteria.
4. Coordinated design to meet acoustics, noise, and vibration criteria with all related disciplines (architectural, structural, mechanical, etc.).

All noise control specifications that relate to these noise calculations shall be included in the written specifications for Mechanical Vibration and Seismic Control provided in a schedule in the Design Documents.

1.5.4 90% Construction Documents

Prepare and submit the following in the 90% Construction Documents package:

1. Final acoustic criteria per program space.
2. Final summary documentation and detailed calculations, as necessary, demonstrating full compliance with criteria related to airborne noise.
3. Final detailed engineering analysis that meets the requirements of Section 1.7 (Special Commentary on Required Engineering Analysis) and proves full compliance with vibration and structure-borne noise criteria.
4. Final coordinated design to meet acoustics, noise, and vibration criteria with all related disciplines (architectural, structural, mechanical, etc.).

Include final noise control specifications that relate to these noise calculations in the written specifications for mechanical vibration and seismic control and/or provided in a schedule on the Project drawings.

1.5.5 Construction Administration

Confirm any changes to the Construction Documents made during construction remain compliant with the acoustics, noise, and vibration criteria.

Submit to the City a testing report with validating measurements demonstrating the acoustics, noise, and vibration criteria are met in all program spaces including:

- Background noise
- Speech privacy
- Structure-borne vibration
- Structure-borne noise

Perform testing based on available industry standards. Submit a request for information to the City for any clarification request related to testing requirements.

1.6 Special Commentary on Vibration Control Approaches

Excess vibration from the Infrastructure Facility may have an adverse effect on occupants of the Joint Development Alternatives. Given the high forces that can be imparted from some bus operations and maintenance equipment onto the building structure, the resulting vibration could travel through the building structure. If strong enough, this vibration can be re-radiated as audible noise and be felt in spaces, which can sometimes be quite far away from the source of vibration.

Based on the foregoing, the City's preferred hierarchy of methods for mitigating structure-borne vibration is in the order of precedence indicated as follows:

1. The preferred method is for the proposed building design to have decoupled structures between the Infrastructure Facility and the Joint Development Alternatives, with sufficient mass in demising constructions to also mitigate airborne noise to project criteria levels.
2. If a building design is proposed that does not entirely decouple the structures (per item 1 above), then acoustically-isolated architectural and/or structural systems shall be introduced where appropriate to meet the Project's vibration criteria.
3. Where neither decoupled structures nor acoustically-isolated systems are possible (per items 1 and 2 above, respectively), the mass of the demising constructions shall be capable of meeting the Project's vibration criteria.

1.7 Special Commentary on Required Engineering Analysis

In all design deliverables, engineering analysis shall demonstrate the Project's vibration criteria is met in the proposed building design. Minimum requirements for the analysis include the following:

1. Measurement and/or other documentation of noise and vibration levels for all equipment planned for the Bus Yard Component.
2. Conversion of the above into forcing functions representing each source.

3. Analysis showing that the source forcing functions do not cause exceedance of vibration and structure-borne noise criteria in the Joint Development Alternatives.
4. Error analysis and factor of safety shall be included.

Principal Project Company shall implement appropriate coordination with the Project's structural engineer to ensure that suitable assumptions regarding the stiffness and damping of floors are considered as part of the design parameters.

2 Seismic Resilience Performance Requirements

A high level of seismic resilience is required for the Project, both due to the SFMTA's role in emergency response and due to its interest in owning, operating, and maintaining a durable capital asset. Building codes aim for life safety but do not necessarily address resilience, which is the ability of a building to support its core functions quickly after an earthquake. Seismic resilience encompasses not just the structural performance of a building in an earthquake but also the performance of architectural, mechanical, electrical, plumbing, and other systems required to support those functions.

The seismic resilience requirements presented in this document draw on the recommendations from a 2009 report by the San Francisco-based think tank SPUR.[1] This report outlines desirable recovery scenarios for the San Francisco civic infrastructure following a major earthquake. Regarding the SFMTA transit system, the report recommends that "service [be] restored for 90 percent of MUNI customers" within 30 days of an "expected earthquake," which is defined as an earthquake event having 10% probability of occurrence in 50 years.

The SPUR report does not specifically address bus maintenance facilities such as the Project's Bus Yard Component. It is expected that buses themselves may be able to run immediately after such an earthquake, while the facilities that support transit operations might lose some functionality temporarily. However, functionality of such support facilities must soon be restored to maintain bus service. Hence it is judged that the Bus Yard Component facility should be operational within that 30-day period of the event if 90% of bus service is to be achieved.

Consistent with the SPUR report, these seismic criteria define functionality requirements for a seismic hazard level given by an earthquake event having 10% probability of occurrence in 50 years, otherwise known as a 475-year event. In these criteria this seismic level is termed the "design-level" event.

An additional structural performance target is defined for a much larger event known as the maximum considered earthquake (MCE_R). This event may be expected to cause more damage and consequent loss of functionality. The California Building Code targets a maximum 10% probability of collapse in the MCE_R event for most buildings. A higher level of performance in the MCE_R is not necessary for the Facility. However, these seismic criteria do specify that the

[1] San Francisco Bay Area Planning and Urban Research Association (SPUR), "Lifelines: Upgrading Infrastructure to Enhance San Francisco's Earthquake Resilience," https://www.spur.org/sites/default/files/publications_pdfs/SPUR_Lifelines.pdf

MCE_R performance be explicitly checked, which is not otherwise required by the code. This provides additional confidence that the intended performance will be attained.

These resilience goals apply specifically to the Infrastructure Facility, but the design of the Joint Development Alternatives must consider the impacts of their performance on transit operations following a large earthquake. Structurally, the Joint Development Alternatives must meet the same performance level as the Infrastructure Facility. However, these performance requirements do not address utilities that only serve the Joint Development Alternatives and whose repair would not impede operation of the transit portion of the Project.

It is possible that the Infrastructure Facility and Joint Development Alternatives could be developed in separate phases. All the requirements and deliverables discussed herein that are related to seismic resilience are applicable in all cases or scenarios for future development, whether in phases or otherwise, and including any interim conditions in between phases.

It is the responsibility of the Principal Project Company to:

- Clearly define phases of development, if any, and the Project scope(s) to be implemented in each phase; and,
- Develop the design and engineering analyses that demonstrate compliance with the seismic resilience criteria set forth herein for each and every phase of the Project's development.

The above objectives are translated into specific requirements in the following sections. The resilience standard for this Project exceeds the code design standard in many areas; however, it should be noted that this resilience standard does not replace full compliance with the governing building code.

2.1 Resilience Requirements

The Project's resilience requirements are stated qualitatively as follows in terms of expected performance at two levels of seismic hazard:

1. Immediate re-occupancy of the Infrastructure Facility after the design-level event ("green tag" expected)
2. Recovery of essential functionality of the Infrastructure Facility within 30 days after the design-level event
3. Maximum 10% probability of collapse of the Project in an MCE_R seismic event

The required approach to attaining these requirements is described in greater detail in the following sections. The seismic hazard levels are defined in Section 2.3 (*Seismic Hazard Definition*).

2.2 Compliance Standard

These seismic resilience requirements adopt the system outlined by the Resilience-based Earthquake Design Initiative (REDi). A copy of this standard can be downloaded free of charge.[2] Other systems of equivalent intent and approach may be used upon review and approval by the City.

In keeping with the resilience requirements stated in Section 2.1 (*Resilience Requirements*) above, the Project's resilience requirements are as required for REDi Gold Level, except as modified in this document.

2.3 Seismic Hazard Definition

The design-level earthquake is represented by an elastic acceleration response spectrum having 10% probability of exceedance in a 50-year period (475-year return period) based on a site-specific probabilistic seismic hazard analysis (PSHA). The MCE_R event shall be as defined by the California Building Code and its referenced standard ASCE 7, having a site-specific PSHA response spectrum with deterministic cap. The spectra shall incorporate damping as appropriate for the type of structure to be designed and the level of damage expected under the two hazard levels.

In order to accommodate any phasing of the permitting and construction of the Facility (for example, with the Infrastructure Facility delivered first and the Joint Development Alternatives delivered at a later date, after completion of the Infrastructure Facility), the MCE_R ground motions for all scenarios defined in Section 2.8 *(Consideration of Joint Development Alternative Scenarios)* used for the purpose of resilience verification shall be determined according to one of following options:

1. The MCE_R response spectrum shall be developed from an envelope across all periods of the MCE_R spectra defined by ASCE 7-16 and ASCE 7-22 for the given site class. A suite of ground motions shall be developed according to ASCE 7 and amplitude-scaled or spectrally matched to the envelope MCE_R response spectrum.
2. A suite of ground motions shall be developed according to ASCE 7 and amplitude-scaled or spectrally matched to the ASCE 7-16 MCE_R response spectrum. The suite shall be then amplitude-scaled by a scalar equal to the average ratio between ASCE 7-22 MCE_R response spectra and ASCE 7-16 MCE_R response spectra within target period range. This scale factor shall not be lower than a ratio between the spectral ordinate of ASCE 7-22 MCE_R response spectra and ASCE 7-16 MCE_R response spectra at the period of the elastic mode which captures the largest percentage of the Infrastructure Facility mass. The average of the suite of ground motion response spectra shall not fall below 90% of ASCE 7-22 MCE_R response spectrum for any period within the target period range relevant to the seismic system.
3. The Facility shall be analyzed using a suite of ground motions developed according to ASCE 7 and amplitude-scaled or spectrally matched to ASCE 7-16 MCE_R response spectra. The structural performance of the Facility shall be Life Safety according to ASCE 41.

[2] Arup, "REDi Rating System: Resilience-based Earthquake Design Initiative for the Next Generation of Buildings," Version 1.0, October 2013, https://www.arup.com/perspectives/publications/research/section/redi-rating-system

4. Any other rational approach of equivalent intent may be used upon review and approval by the City.

The design-level earthquake spectrum as defined by the California Building Code may not match the PSHA for all building periods at this site. The code-specified seismic hazard shall be utilized for confirming compliance with all code requirements. For evaluating structural and non-structural performance according to Section 2.5 (*Structural and Non-Structural Performance Requirements*), as well as for loss and downtime assessments according to Section 2.6 (*Loss and Downtime Assessment*), the PSHA shall be used in lieu of the code spectrum.

A structure designed solely according to code requirements will likely not meet the resilience requirements under the PSHA hazard. Therefore, the design team shall check these requirements at various stages of the design to ensure that appropriate decisions are made in a timely manner.

2.4 Structural Analysis Method

Principal Project Company shall conduct a nonlinear response history analysis (NLRHA) to validate compliance with the Project's resilience requirements. This analysis involves developing a detailed digital model of the Project's structural system and simulating the building's response to earthquake ground motions ("time history records") that have been selected specifically to match salient characteristics of the Project Site and nearby source faults.

Deliverables and their timeline are set forth in Section 2.8 (*Timeline of Deliverables*). Structural response parameters required by Section 2.5 (*Structural and Non-Structural Performance Requirements*) and Section 2.6 (*Loss and Downtime Assessment*) shall be obtained from such analysis, which shall be conducted at both the design-level earthquake hazard and the MCE hazard as applicable.

Time history records shall comply with ASCE 7 provisions. For this analysis, expected material properties may be used where appropriate and as defined in ASCE 41. Nonlinear analysis guidelines given by NIST GCR 17-917-45, "Recommended Modeling Parameters and Acceptance Criteria for Nonlinear Analysis in Support of Seismic Evaluation, Retrofit, and Design," are considered acceptable.

NLRHA need not be used for calculations to validate code compliance, unless required by the code.

2.5 Structural and Non-Structural Performance Requirements

The structural system of the Infrastructure Facility shall meet immediate occupancy performance as defined by ASCE 41 subject to the design earthquake. This performance level shall be deemed to satisfy the requirement of Section 2.2.4 of the REDi standard referenced above.

The structural system of the Infrastructure Facility shall additionally meet collapse prevention performance as defined by ASCE 41 subject to the MCE_R hazard, unless life safety performance is required by Option 3 of Section 2.3 *(Seismic Hazard Definition*.

Non-structural performance for components necessary to the operations of the Infrastructure Facility shall meet, as a minimum, the operational nonstructural performance level as defined by ASCE 41 subject to the design-level earthquake, but not less than any code requirements. Compliance with this requirement shall be confirmed using mean accelerations and displacements derived from response history analysis.

Additionally, equipment required to be operational for resumption of the Infrastructure Facility's transit functions (as defined in Section 2.6 (*Loss and Downtime Assessment*)) shall be seismically certified according to the requirements specified in ASCE 7-22 Section 13.2.6. Other alternatives to seismic certification that can be confirmed to support functionality within the required recovery period may be used upon review and approval by the City.

2.6 Loss and Downtime Assessment

Principal Project Company shall conduct a downtime assessment as described in Section 4.3 of the REDi standard (referenced above) to confirm that the Project's requirement for post-earthquake recovery is met. The methods, assumptions and results of this assessment shall be documented in a written report as indicated in Section 2.8 (*Timeline of Deliverables*). This assessment shall utilize building response parameters extracted from the response history analysis at the 475-year hazard. The results corresponding to the 75% confidence level shall be used.

The direct financial loss assessment described in Section 4.2 of the REDi standard may be omitted. This assessment may, but need not, utilize the PACT software which is mentioned in the REDi standard.

For this analysis, functional recovery shall been achieved when the following systems are functional:

1. For the entire Facility:
    a. Fire protection systems and fire-rated barriers
    b. Sanitary sewer and storm drain systems
2. For the Infrastructure Facility (including consideration of the impacts of the Joint Development Alternatives on the Infrastructure Facility):
    a. Power and lighting systems
    b. Domestic hot and cold water systems
    c. Bus maintenance equipment
    d. Access controls systems
    e. Security systems

In order to meet the REDi Gold standard, only aesthetic damage to the above systems shall be permissible immediately after the design earthquake, unless Principal Project Company can demonstrate that a given component in the above systems can be easily and readily replaced to achieve the same functional recovery criterion.

In January 2020, a City ordinance banned the use of natural gas in new construction. In addition, in the event of a large earthquake the City's existing supply of natural gas will very likely be disrupted for a period of time that is greater than the Project's required functional recovery time. For both of these reasons natural gas will not be permitted for the Project's systems which provide the above essential functions.

2.7 Seismic Resilience Peer Review

The City will retain a seismic resilience peer review consultant to perform the following scope of work:

1. Review of basis of design document, which shall include design criteria for structural and non-structural components
2. Review of structural analysis model assumptions and methods
3. Review of seismic hazard and ground motions used for analysis
4. Review of downtime assessments
5. General review of seismic system and non-structural detailing

The peer reviewer will be periodically engaged by the City to confirm design intent is being met. Principal Project Company shall prepare and submit deliverables, as described in Section 2.9 (*Deliverables and Timeline for Seismic Resilience Peer Review*), to the City for review and approval.

The Principal Project Company shall support the peer review process (e.g., by working with the peer review team and incorporating their comments) and incorporate the appropriate peer review check points into the PA Term.

The seismic resilience peer review does not replace any code mandated structural peer review.

2.8 Consideration of Joint Development Alternative Scenarios

The Infrastructure Facility and Joint Development Alternatives may be developed in separate phases. refer to Division 1 for the Project Description, and Division 3 (*Design Criteria Document*), including Appendix G (*Design Criteria Para-Transit*).

There are two Joint Development Alternatives – a Housing and Commercial Component adjacent to and atop the Infrastructure Facility, and a Paratransit Component atop the Infrastructure Facility.

Principal Project Company shall accommodate, at a minimum the following three Joint Development Alternative scenarios with respect to the use of the roof of the Infrastructure Facility. In all cases, the design of the Infrastructure Facility shall achieve the seismic resilience requirements set forth herein under any of the three alternative use scenarios.

All the applicable Technical Requirements for the Infrastructure Facility will apply to the Paratransit Facility if built.

The Joint Development Alternative scenarios are, as a minimum, defined in Table 1 as follows. Components of the Housing and Commercial Component Alternative planned to be built on the roof of the Infrastructure Facility are referred to as "Podium Roof HCC".

Table 1: Requirements for alternative use scenarios for the roof of the Infrastructure Facility (in addition to those specified elsewhere in the Technical Requirements)

Joint Development Alternative Scenarios	**Structural design requirements for the Infrastructure Facility (in addition to those specified elsewhere in these Technical Requirements)**	**Bus Yard Component operational continuity requirements (in addition to those specified elsewhere in these Technical Requirements)**
1. Podium Roof HCC built after start of operation of the Infrastructure Facility	• Design to support temporary construction loadings associated with at least one feasible method to realize the future construction of the Podium Roof HCC. Principal Project Company shall submit the temporary construction loading plan for SFMTA review and concurrence.	• Any modifications to the Infrastructure Facility required to accommodate the Podium Roof HCC shall be capable of being constructed without interrupting or disrupting operations in the Infrastructure Facility
2. Paratransit Component built after start of operation of the Infrastructure Facility (see Appendix G of Division 3 of the Technical Requirements)	• Design the roof level using the same live loads, programming requirements for superimposed dead and live loads (unless programing is updated), and structural performance requirements as for the bus maintenance and parking levels within the Infrastructure Facility (defined in Division 3 of the Technical Requirements) • Accommodate extension of the Bus Yard Component's scissor bus ramp system to access the roof of the Infrastructure Facility • Design to support temporary construction loadings associated with at least one feasible method to realize the future construction of the Paratransit Component. The Principal Project Company shall submit the temporary construction loading plan for SFMTA review and concurrence. • Design the Infrastructure Facility roof to support a photovoltaic solar panel array	• Any modifications to the Infrastructure Facility required to accommodate the Paratransit Component shall be capable of being constructed in such a way as to **completely avoid**: o Interruption or disruption of operations in the Infrastructure Facility, except for Bus Yard Component Level 4 which shall not be interrupted for more than [30 days] o Relocation or reconstruction of any facilities, rooms, equipment, and/or building systems necessary for operations in the Infrastructure Facility, unless expressly agreed by the City • The Principal Project Company shall work with the SFMTA to further minimize the length of time and physical extent of any interruptions or disruptions to Bus Yard Component operations on Level 4
3. No occupied use of the roof of the Infrastructure Facility (whether a temporary or permanent condition)	• Verify that the seismic resilience requirements of Section 2.1 through 2.7 are met for the Infrastructure Facility in the absence of any other structure on top • The Infrastructure Facility roof shall be able to support a photovoltaic solar panel array	

2.9 Deliverables and Timeline for Seismic Resilience Peer Review

Deliverable	Design Stage	Seismic Resilience Peer Review Actions
Structural drawings showing all sizes and connection details for elements of the primary seismic force resisting system	50% DD	Confirmation that design meets design criteria.
Final Basis of Design Documents including final NLRHA results, and downtime assessment report. This shall include check of all Joint Deliverable Alternative scenarios, per the requirements of Section 2.8 (*Consideration of Joint Development Alternative Scenarios*). Seismic Certification Plan. This plan shall include, for each nonstructural component required for essential functionality, the following information: • Required testing procedure including project specific testing plan, or • approvals based on past test results such as HCAI OSP or similar, or • Alternative approach with confirmation that the component will be operational within the required recovery time. The Seismic Certification Plan shall include a feasible timeline for carrying out the planned procedures that is compatible with the overall Project schedule.	100% DD	Confirmation that basis of design meets design criteria, and that sufficient NLRHA and downtime assessment results are presented to validate required performance. Confirmation that the Seismic Certification Plan meets the intent of the resilience standard.
Structural Drawings showing final configuration and sizing of seismic force resisting system and related details. Final Seismic Certification Plan, including any revisions to the 100% DD document and the status of planned testing.	90% CD	Confirmation that no changes are made from the 100%DD structure/resolved peer review, including the Seismic Certification Plan, that materially alter the agreed design intent, unless accompanied by a new validation package (as required and specified above at the 100% DD stage).

Division 5: Battery-Electric Bus Supplemental Criteria

POTRERO YARD MODERNIZATION PROJECT

Exhibit 18:
Technical Requirements

Division 05:
Battery-Electric Bus Supplemental Criteria

November 06, 2024

FINAL DRAFT

Table of Contents

1. INTRODUCTION

This Division 5 includes the Technical Requirements and planning criteria to enable a future transition of the Project's Bus Yard Component from supporting electric trolley buses (ETB) to supporting battery electric buses (BEB) while maintaining operational flexibility and minimizing disruptions.

The City's current fleet management strategy is to open the Project with a 100% ETB fleet and operate those initial vehicles through their useful lifetimes before potentially beginning the BEB transition at the City's discretion. This places the potential initial deployment of BEBs likely to begin no sooner than 2040.

The Technical Requirements for the BEB Charging Equipment solution and the associated electrical feed requirements described herein (refer to Section 2.2 and Exhibit B) provide the minimum design requirements for the potential, future deployment of BEB to be served by the BEB Charging Infrastructure.

Principal Project Company shall design and construct the BEB Charging Infrastructure per the requirements in this Division 5. This includes but is not limited to the designed and maintained space for electrical distribution from the existing and future electrical feeds to the BEB Charging Equipment and charging positions, design and installation of wireways and raceways in the bus parking areas to allow for seamless transition to BEBs upon the staged transition from the overhead catenary system, and the Project to fully support the operational requirements of the detailed charging system below upon the City 's direction to deploy the system at a date of their choosing.

As further detailed in Section 2.2 of this Division 5, two electrical utility feeds are projected to serve the Infrastructure Facility upon the transition and deployment to BEB. The initial feed, for mixed-use service is indicated on WDT application as feeder 2, shall be in place at the time of Substantial Completion and will serve the needs of the entire Infrastructure Facility and all building functions except for the final one hundred twenty-eight BEB charging positions required for the ultimate BEB fleet projected.

The second feed, for BEB charging service is indicated on WDT application as feeder 1, may not be energized at the Project Site upon Substantial Completion, but Principal Project Company shall provide all of the space, building systems, conduit pathways, penetrations, wireways, raceways, and all other considerations necessary to enable distribution into, throughout, and within the Infrastructure Facility to facilitate its operation upon implementation and connection of this feeder 1.

This Division 5 contains detailed information on the City's BEB conversion planning and describes:

1. Envisioned implementation of BEB support infrastructure in the City's bus facilities in general, and in multi-level bus facilities in particular.
2. Specific approach to BEB improvements for this Project, including fleet conversion plans, and site-specific information that will assist Principal Project Company to deliver the City's vision during the Term.

For the purposes of designing the Infrastructure Facility and developing cost, schedule, and risk analyses, and during the Term, the Principal Project Company shall adhere to the following definitions and categories:

- **BEB Charging Infrastructure**: means the necessary layout space and clearances for future switchgear, power distribution systems (including any required feeders), housekeeping pads, housings, integrated structural components, space for mounting solution(s), and associated wire ways, conduit, and cable trays; space and penetrations for the required routing layout to support the future charging system's associated IT cabling (whether fiber optic or of other types), as set forth in Division 5 of the Technical Requirements.

Regardless of the design approach, the Charging Infrastructure shall include all Infrastructure Facility improvements installed upon Substantial Completion that enable the future deployment of BEBs and the proposed Charging Equipment detailed in this Division 5 without invasive or destructive measures needed to do so. The design of the facility structure shall adequately account for the weight requirements of the proposed future charging and electrical equipment. There shall be no major additional capital improvements needed to run the BEB system, unless agreed to and approved by the City, in its sole discretion to install those BEB Charging Infrastructure equipment and electrical distribution systems mentioned above. Charging Infrastructure feeds and supports the Charging Equipment, as described in the next item in addition to the BEB Emergency Power requirements defined in Section 2.3.

- **BEB Charging Equipment**: means the future overhead inverted pantographs, charging cabinets, dispensers, switchgear and associated wire ways, conduit, and cable trays that provide the point-to-point contact where individual BEBs connect to the overall charging system.

The BEB Charging Equipment must be capable of being connected to the BEB Charging Infrastructure to enable charging of a BEB fleet according to the performance requirements defined in this document and according to the City's BEB fleet growth plans. The BEB Charging Equipment shall include the charge management/operations software solution (including the Electric Vehicle Charge Management System) to enable the Infrastructure Facility to successfully operate a BEB fleet, meeting the requirements set forth by the City at the time of their future BEB deployment. The inclusion of BEB Charging Equipment in this Agreement is expressly excluded, and its inclusion shall be contingent upon the City 's sole discretion to determine future scope.

The interface point between the BEB Charging Infrastructure and the BEB Charging Equipment shall be the termination point of all wire ways, conduit, and/or cable trays to the charging cabinets or future location of charging cabinets.

1.1. Background

Per the California Air Resources Board's Innovative Clean Transit regulations, the City must convert to a zero-emission bus fleet by 2040. To enable this transition, the City drafted a Zero Emission Facility and Fleet Master Plan (Zero-Emission Plan) through a partnership with WSP USA, Inc. The Zero-Emission Plan provides a roadmap for the City's successful facility and infrastructure transition and upgrade, and will position the City to put these capital projects forward for capital funding that may become available in the future for BEB facility projects.

The City currently operates the largest fleet of zero emission ETBs in North America. The City plans to transition all routes that are currently served by diesel/hybrid buses fully with BEBs; this move requires converting all of the City's existing bus maintenance facilities into facilities capable of charging, maintaining, and operating these vehicles.

The requirements in this Division 5 are based on current information available to the City and may be updated by the City from time to time.

As part of the City ’s goal to achieve a 100% zero-emission fleet by 2040, the City will begin the large-scale procurement of BEBs in or around 2025.

Through the Zero-Emission Plan, the City is carefully charting a schedule for the adoption of new vehicles, gradual retirement of existing coaches, overhaul of existing facilities, and integration of BEB Charging Infrastructure.

1.2. 2021 SFMTA 40-Foot BEB Pilot Program

Since 2021, the City has been conducting a pilot program to evaluate the performance, reliability, operability, and maintainability of the 40-ft BEBs that are currently available on the market, and to gain experience with BEB Charging Infrastructure to prepare for future fleetwide adoption (the “2021 40-ft Pilot”). The City anticipates the conclusion of this pilot program in mid-2024.

The City expects that the 2021 40-ft Pilot will provide valuable insight into the state of the BEB market and that the conclusion of the 2021 40-ft Pilot will pave the way for successful adoption of 40-ft BEB as part of the City ’s future BEB procurement strategy.

The City is in the preliminary stages of implementing a 60-ft BEB pilot to evaluate the feasibility of those vehicles in the City ’s operating environment; bus procurement for this pilot program is scheduled to begin in 2025.

As part of the 2021 40-ft Pilot, the City procured three 40-ft BEBs each (total of nine) from New Flyer, BYD, and Proterra, and one 40-ft BEB from Nova in summer 2021, with two additional Nova Bus 40-ft BEBs scheduled to be delivered by the end of 2023. These buses will be tested in regular revenue service in San Francisco for a period of 18 months. Upon the conclusion of the 2021 40-ft Pilot, the City will develop guidance on the following topics:

1. Which existing 40-ft BEB models can meet the City ’s service requirements.
2. The routes and service roles, if any, that cannot be serviced by BEBs.
3. The maintenance requirements and practices for a BEB fleet.
4. The replacement ratio that will be required when transitioning from diesel hybrid buses and trolley buses to BEBs.
5. Which specifications and requirements (battery capacity, ground clearance, telematics systems, etc.) will be kept or modified for future full-scale procurements.
6. The charging methodology and operating profile required for sustained operation of BEBs in full-scale deployment.
7. Optimum bus yard storage and yard management practices.

2. BEBS AT POTRERO YARD

Potrero Yard currently houses 146 trolley buses: 53 40-ft buses and 93-60ft buses.

If and when the City directs the transition to BEBs in the future, the Infrastructure Facility shall accommodate the vehicle size and type specified in Exhibit A (*Battery-Electric Bus Specification*) of this Division 5 at a minimum. The BEB fleet shall be parked in a contiguous area in the Infrastructure Facility's allocated bus parking layout, unless agreed to and approved by the City, in its sole discretion.

Table 1 shows the capacity and fleet size allocation for the Project upon Substantial Completion. **Table 2** below shows the total planned capacity for the Project after the Infrastructure Facility is fully transitioned to BEBs.

Moving from the fleet capacities shown in **Table 1** to those in **Table 2** will require the City to perform off-site fleet management to move some 40-ft vehicles offsite, over time, to accommodate more 60-ft vehicles at Potrero Yard. It will also require modifications to the location of the overhead BEB charging equipment to serve the fleet in use at a given time.

Table 1: Potrero Bus Fleet Capacity upon Substantial Completion of the Infrastructure Facility

Location	BEBs		ETBs		Total Buses
	40'	60'	40'	60'	
Potrero Bus Yard	0	0	138	93	231

Table 2: Potrero Bus Fleet Capacity After Fully Transitioning to BEBs (no sooner than 2040)

Location	BEBs		ETBs		Total Buses
	40'	60'	40'	60'	
Potrero Bus Yard	53	160	0	0	213

2.1. BEB Power Supply Approach

The Facility shall be designed to support the operation BEBs using an optimized charging strategy. This strategy will integrate data from vehicle battery charge and depletion, the bus telematic system, and revenue route planning with available utility and power information at a minimum upon City 's direction to transition to BEBs. The optimized charging strategy requirements to meet this operational criteria will be further defined by the City upon their decision to begin the ETB to BEB transition process at the Potrero Yard.

Due to the timeline required for the electrical service applications and system studies, the City has submitted two applications for electrical service to the San Francisco Public Utilities Commission, which serves as intermediary for City departments for all communications concerning Hetch Hetchy Power with PG&E.

Electrical services requests may be re-evaluated for initial deployment and space provisions in Infrastructure Facility design considered for additional feeds and switchgear closer to commencement of the ETB to BEB transition (currently proposed to begin no sooner than 2040).

These applications have requested the full electrical load that has been estimated by the City to be required to operate the ultimate total anticipated 213 BEBs on an optimized charging strategy. This estimate is based off the ultimate BEB fleet projected to be operated from Potrero Yard after the completion of a transition from ETBs. This transition is projected to begin no sooner than 2040 and the associated load requirements may be re-evaluated between 2035 and 2038 to plan for 2040 deployment timeframe.

Per the applications for electrical service, the power supply for BEB's is expected to be split across two feeders upon its deployment to allow for immediate redundancy.

The City has been advised by the SFPUC that the maximum service request per application is 10 MW.

2.2. BEB Power and Infrastructure Performance Requirements

During the Term, Principal Project Company shall prosecute and manage the ongoing electrical service applications and continue working with the SFPUC and PG&E toward a resolution of the engineering design and construction challenges, the cost, and the schedule to bring the requested electrical service to the Infrastructure Facility.

At Substantial Completion, the Facility's electrical room and all necessary electrical equipment, appurtenances, and provisions shall include a microgrid controller compatible to accommodate the BEB program at full build-out. Additionally, the Infrastructure Facility shall be capable of accommodating the full BEB program based on an optimized charging strategy, and shall adhere to the following requirements:

1. The Infrastructure Facility shall be equipped with all the BEB Charging Infrastructure to accept the future deployment of BEB Charging Equipment required to operate the full programmed fleet of 213 BEBs .
2. The BEB Charging Infrastructure shall be ready to connect to all future placement of additional BEB Charging Equipment in such a way to ensure minimal intrusion and disruption to transit operational continuity at the time of installation and connection of the future placement of all BEB Charging Equipment required to transition the facility from ETBs to BEBs.
3. The mounting provisions for the ETB OCS parking spaces shall be designed to ensure a seamless transition from ETB parking spaces to BEB parking spaces.

Principal Project Company shall ensure that adequate space is planned for and created in the Infrastructure Facility so that the future BEB Charging Equipment can be installed, operated and seamlessly integrated with the Charging Infrastructure without modification to the Infrastructure Facility.

The technical specifications that are the basis of design for the future deployment of BEBs at the site, along with select design modules of the BEB Charging Equipment, are attached as Exhibit B, C, and D to this Division 5. The BEB Charging Infrastructure design in Exhibit D (*Conceptual Design Module Package*) is a proof of concept for one approach to deploying the BEB Charging Equipment layout and technology. It is neither prescriptive nor restrictive, allowing for the development of alternative charging approaches, equipment layouts, required power analyses, or other physical arrangements and charging technologies. Refer also to general notes in Exhibit D for additional context.

The following are the basic technical requirements for the BEB Charging Equipment to be supported by the BEB Charging Infrastructure. Additional requirements may be developed during the Term.

- All charging shall be done within the Infrastructure Facility.
- Overhead DC inverted pantograph chargers shall be utilized for all bus parking spaces.
- Plug-in DC charging systems shall be programmed for all preventive maintenance bays that require overhead charging for the trolley bus configurations. These plug-in DC charging dispensers shall be installed at the rear left side of the maintenance bays with charging cable stored on a cable reel.
- All overhead in-yard charging systems shall be capable of providing a minimum charging level of 150 kW, and safely recharge 40-ft BEB energy storage system (ESS) from 10% state of charge (SOC) usable in vehicle to 90% SOC usable in vehicle in less than four (4) hours.
- All plug-in DC charging systems shall provide a minimum charging level of 50 kW, and safely recharge 40-ft BEB ESS from 10% SOC usable in vehicle to 90% SOC usable in vehicle in less than ten (10) hours.
- Plug-in charging systems shall utilize a concurrent charging enabled charger to energize multiple connected dispensers at once.
- The maximum charging cabinet to plug-in dispenser ratio is 4:1, so long as DC/communications 300-foot limit is maintained, and all other Technical Requirements are achieved.

While still meeting the number of maintenance bays required in Division 3 of the Technical Requirements, Principal Project Company shall evaluate and, if space in the bus parking area allows, provide an additional 18” width on the left side of each preventive maintenance bay equipped with plug-in charging systems to allow for safe staff movement around a BEB connected to a plug-in charge connector without interfering with the charge connector or port door.

The charging system shall be compatible, at a minimum, with the following long-range e-bus manufacturers:

1. Proterra
2. New Flyer
3. BYD
4. Nova Bus
5. Gillig

The BEB infrastructure industry is rapidly developing and innovating. Accordingly, the criteria described in Exhibits B and C are set forth as minimum standards and technical requirements.

2.3. BEB Emergency Backup Power Requirements

PG&E reliability data from 2006 to 2015 show that there is an average of one power outage every two years. On average, a power outage in the San Francisco service environment lasts 78 minutes before service is restored. In recent years, power outages have been intentionally implemented by Northern California utility companies in anticipation of wildfires during summer months, which may increase outage length and frequency in future years.

As the City converts its fleet to BEB's, the fleet becomes heavily dependent on electrical utility partners and the resiliency of the SFPUC's and PG&E's electrical infrastructure. In the event of large-scale, sustained electrical outage, the BEB fleet would not have the ability to operate. The City is seeking cost- efficient methods of achieving electrical redundancy to continue providing service and emergency response functions.

The City 's first layer of redundancy is in the electrical service applications, where the City has split the BEB fleet electrical loads into two separate applications. As such, two feeders will enter the site, allowing a portion of the fleet to be powered in the event one feeder is out of service. These applications, the City will also investigate the potential for the two feeders to be fed by two separate PG&E substations, which will add to the resiliency of the fleet.

Currently, the City is not considering procuring a completely redundant power supply from the SFPUC and PG&E (e.g., doubling the facility and BEB electrical requirement) due to cost.

However, the City wants built-in redundancy to power a portion of the BEB fleet once deployed, at City 's discretion.

The following redundancy requirements shall be included in the Charging Infrastructure:

1. In addition to the emergency backup power requirements, 20% of the Potrero Division's fleet (approximately 43 vehicles) shall be connected to a redundant power supply, subject to applicable codes. This backup power requirement must fully charge 20% of the fleet vehicles in under 9 hours.
2. To the extent feasible,, this backup power shall be provided by on-site renewable sources (e.g., photovoltaic panel and battery storage system) that are not dependent on fossil fuels.
3. To prepare for future needs, space shall be allocated for three energy storage system (ESS) battery packs, each approximately 10 feet by 40 feet (with clearances to be confirmed in the applicable code).
4. Space is available to serve the future resiliency solution when the BEB transition begins.
5. An emergency operations plan describing how the emergency fleet would function based on the Infrastructure Facility's backup power design.

Principal Project Company shall also consider the long-term role the City 's proprietary DC traction power system could play in backup power, once the Facility transitions fully to BEB.

2.4. Reference Design Concept Figures Related to BEBs

This Division 5 includes a sample design solution for accommodating the required BEB Charging Infrastructure. The sample design includes an overhead gantry to mount pantographs and charging cabinets.

The City encourages creativity and innovation in the design of the BEB Charging Infrastructure to support the future deployment of the BEB Charging Equipment. While Principal Project Company shall comply with the minimum standards outlined in Section 2 (*BEB's at Potrero Yard*), they have flexibility to determine the spatial design approach.

2.5. Requirements for Facility Conversion Phasing

Upon the City ’s start of the transition from ETBs to BEBs, 60-ft trolley buses are expected to be replaced with BEBs. The City requires that:

1. During Term, Principal Project Company shall work with the City to plan for the transition, including adapting to any changes that the City may need to implement to its fleet transition plan, and design the Facility to accommodate the opening day requirements with optimal flexibility.
2. Principal Project Company shall implement those plans and continue to work with the City to prepare for its fleet transition.

For the BEB transition, the City requires that:

1. The transition shall occur in phases, preferably one bus parking lane at a time to align with the procurement schedule of the BEB’s
2. The OCS for the ETBs shall be replaced with the overhead Charging Equipment required for the BEBs.
3. Future BEB Charging Equipment shall seamlessly integrate with each prior phase’s existing Charging Equipment and Charging Infrastructure and shall be backwards- compatible with existing BEBs.
4. Future BEB Charging Equipment shall be incorporated in the Infrastructure Facility’s management solution upon activation/commissioning of the BEB Charging Equipment and any modifications to the BEB Charging Infrastructure.

3. EXHIBIT A: BATTERY-ELECTRIC BUS SPECIFICATIONS

Table 3 as follows provides an example description of the potential fleet vehicle the City is likely to pursue upon transition to BEBs. The below general dimensions exclude exterior mirrors, marker and signal lights, flexible portions of the bumpers, and fender skirts.

Table 3: Coach Requirements

Item	40’ E-bus	60’ E-bus
Length, excluding bumpers	41’ +/- 2’	60’ +/- 2’
Width – exterior, excluding mirrors	102” max	102” max
Height Overall, without roof-mounted HVAC system	134” max	134” max
Height Overall, with roof-mounted HVAC system	140” max	140” max
Front Door Height from Ground (normal)	15.5" max	15.5" max
Front Door Height from Ground (kneeled)	13" max	13" max
Rear Door Height from Ground (normal)	17.5" max	17.5" max
Body Ground Clearance	8" min	8" min
Approach Angle with/without Over-raise Feature	9 degrees min	9 degrees min
Break over Angle with/without Over-raise Feature	8.9 degrees min	8.9 degrees min
Departure Angle with/without Over-raise Feature	9 degrees min	9 degrees min
Turning Radius (Outside Body Corners)	45 feet max.	45 feet max.
Axle Zone Clearance	5” min	5” min

BEBs will be equipped with overhead chargers compliant with SAE J3105 (ISO 15118 and IEC 61851 Parts 1 and 23). The center of the overhead charging rails shall be installed above the center of the front door of the coach.

Any charging system used shall be capable of 2-way communication with the Bus ESS and battery management system (BMS). The charge management/operations software solution shall include the following protections and driver alerts: (i) dynamic state of charge of the energy storage system, and (ii) charge rate. Both the bus and charger systems shall be capable of independently commanding an emergency stop of the recharge cycle should a critical fault occur. The City requires a contact style charging interface (SAE J1772 CCS Type 1) to be provided on the rear of the coach on both streetside and curbside.

4. DIVISION 05 - EXHIBIT B: BASIS OF DESIGN – SECTION 11 11 36.14 COMMERCIAL ELECTRIC VEHICLE CHARGING UNIT FOR TRANSIT DEPOTS

The following design specifications and conceptual design modules for the BEB Charging Equipment provide the minimum requirements for sizing the BEB Charging Infrastructure, operational requirements, and minimum spatial needs of the proposed BEB Charging Equipment which shall be installed at a later date upon City's sole discretion and supported by the BEB Charging Infrastructure in place at Substantial Completion.

Note that any references to submittals in the following indicative design specifications are provided as guidance only and are not required to be adhered to as part of the Project.

SECTION 11 11 36.14

COMMERCIAL ELECTRIC VEHICLE CHARGING UNIT FOR TRANSIT DEPOTS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Guide specification of equipment items as listed below by Equipment Mark Number are provided to establish minimum performance requirements, operational criteria, and standards compliance of a DC charging system for commercial battery electric vehicles charged via automated connection to overhead charging rail on vehicle roof and by handheld manually inserted plug. Alternative systems that comply with these minimum performance requirements, operational criteria and standards compliance but are achieved by physically different equipment configurations than the guide layout and the components listed but achieve the same verifiable results will be considered and reviewed by the City as equivalents. DC overhead charging system to consist of:

1. CHARGING CABINET, BATTERY ELECTRIC BUS, 150kw DC POWER Equipment Mark Number: 8012

2. CHARGING PANTOGRAPH, INVERSE, FACILITY MOUNTED Equipment Mark Number: 8020

3. REMOTE PLUG-IN DISPENSER Equipment Mark Number: 8025

B. Installation of equipment with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Utilities to be roughed in at location recommended by manufacturer.

D. Coordination of equipment and vehicle to allow for automated operation and communication of the Charging Pantograph, Inverse, Facility Mounted, Equipment Mark Number: 8020 with the Owner's battery electric bus fleet. Coordination with other equipment and/or items shall include, but not necessarily be limited to, the following:

1. Equipment Mark Number 8030 Electric Vehicle Yard Management System as specified in Section 11 11 36.20 Electric Vehicle Yard Management System

E. Coordination of equipment and vehicle to allow for corded handheld plug (charge connector) and communication of the Remote Plug-In Dispenser Mark Number: 8025 with the City's battery electric bus fleet. Coordination with other equipment and/or items shall include, but not necessarily be limited to, the following:

1. Equipment Mark Number 8030 Electric Vehicle Yard Management System as specified in Section 11 11 36.20

1.2 QUALITY ASSURANCE

A. Equipment shall be produced by a manufacturer of established reputation with a minimum of five years' experience supplying specified equipment

B. Manufacturer's Representative:

1. Installation: Provide a qualified manufacturer's representative at Project Site to supervise work related to equipment installation, check out and start up.

2. Training: Provide technical representative to train the City's maintenance personnel in operation and maintenance of specified equipment.

3. Testing: Provide technical representative for final testing of equipment.

C. Installation of this equipment item requires initial mock-up and acceptance by design team and the City. Refer to Part 3.02 of this specification section Installation for more details

1.3 STANDARD AND REGULATORY REQUIREMENTS

A. Equipment indicated within this specification section shall comply with all applicable Laws, including seismic, fire, and racking codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.4 SUBMITTALS

A. Submittal requirements for all equipment items included in this section are listed below.

B. Product Data:

1. Submit product data in accordance with Division 1 - General Requirements of these specifications.

2. All product data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.

3. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

C. Operation and Maintenance Manual:

1. Provide a complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Description of system and components.

b. Manufacturer's printed operating instructions.

c. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

d. List of original manufacturer's parts, including suppliers' part numbers and cuts, manufacturer's recommended spare parts stockage quantity and local parts and service source based on anticipated frequently replaced and or long lead (more than five workdays) components.

2. ssemble and provide copies of manual in 8-1/2 by 11-inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

D. Shop Drawings: Submit shop drawings in accordance with Division 1 -General Requirements of these specifications.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for all instances of submitted equipment in a floor plan view and reflected ceiling plan view for DC charging cabinets, dispenser (pantographs and remote plug-in cabinets) and other system elements. The drawings shall further include dimensions from structural elements or architectural grid lines, to each major charging equipment item (8012, 8020 & 8025) operational clearances, locations of any utility service connection points, power and communication output points, mounting requirements, and structural supports required for the submitted equipment. Indicate which specific dispensers are connected to and energized by which specific DC charging cabinet.

2. Manufacturer's standard installation drawings will be accepted and reviewed but are not considered as a replacement to project specific shop drawings.

E. Test Reports: Testing and Commissioning reports are required for all systems included in this specification and shall be included as part of the close-out documents. Provide to the equipment consultant a copy of all testing and commissioning reports for equipment specified herein. Refer to Part 3.03 Testing, of this specification.

F. Required Documents for Permit and Local Jurisdictional Approval: Where required by local jurisdiction and/or code officials, the Principal Project Company shall be responsible for producing and submitting all documentation required for obtaining all applicable approvals related to the specified equipment. This documentation may include, but may not be limited to, engineered signed and stamped plans, details, anchorage layouts for equipment on stands and as racks to show compliance with locally adopted ASCE, seismic, fire, and other codes. A copy of these required documents shall be included with the product submittal to the design team/consultant team for their review.

1.5 WARRANTY

A. Warrant work specified herein for one year from Substantial Completion against defects in materials, function, workmanship and charging system operational design.

B. Warranty shall include materials and labor necessary to correct defects including replacement of charging system operational elements with re-designed components.

C. Defects shall include, but not be limited to loose, damaged and missing parts and abnormal deterioration of finish, excessive cord wear.

D. Operational design defects include for pantograph charger and dispenser include systemic bent or non-flexing conductor rails, non-extending / retracting of pantograph due to factory installed elements, failure or intermittent failure to instigate charging process and pantograph deployment due to inability to connect and / or non-communications with vehicle properly aligned below pantograph, failure to deploy pantograph, initiate or complete charging process due to interference from adjacent installed pantographs is an operational design defect. Pantographs conforming to this performance specification are intended to perform in a dense bus parked environment with anticipated adjacent pantographs and battery electric buses on all four sides of surrounding each installed pantograph. Operational design defects for DC charging cabinet and plug-in dispenser include systemic bent charging and charging communications connector pins, damaged charging cord conductors and internal wiring, breakage and deterioration of charging plug-in mating elements (ports, charging connector) during routine daily use of charging system. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during shipment and storage in humid, dusty conditions. Equipment shall be stored per manufacturer's recommendation.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and mark number of this specification.

C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.7 LABELING

A. Manufacturer shall securely attach in a prominent location on each major item of equipment a non- corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (U.L.), or other US National Recognized Testing Laboratory (NRTL) acceptable to both the design team and local code officials, in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 - PRODUCTS

2.1 CHARGING CABINET, BATTERY ELECTRIC BUS, 150KW DC POWER EQUIPMENT MARK NUMBER: 8012

A. General:

1. Description: Upright cabinet(s) connected to multiple charger dispensers including:

a. Facility mounted inverse charging pantograph, and capable of automatically charging the connected battery electric bus (BEB) utilizing DC electrical power. Intended for long term charging of BEBs in overnight parking positions. Unit must be capable of operating in dense installation of multiple mark 8012 charging cabinet units located in same general area.

b. Facility mounted standalone stationary cabinet dispenser capable of charging a battery electric bus utilizing DC electrical power after being manually connected to a battery electric bus by a flexible power cord and handheld plug. Intended for short term charging of BEBs in maintenance and service bays.

2. Coordination: Specification information indicated herein is intended as general requirement only. Final design of the system shall be by the manufacturer and shall be presented in the project specific shop drawings in coordination with the Charging Pantograph, Inverse, Facility Mounted Equipment Mark Number: 8020 and Remote Plug-In Dispenser Mark Number 8025 as a fully coordinated, complete design.

3. Compliance: The equipment and final design shall comply with the most current editions of all applicable local, state, and federal codes and regulations, including, but not limited to, those listed below.

a. SAE International Standard J3105, Electric Vehicle Power Transfer System Using a Mechanized Coupler, most recent edition

b. SAE International Standard J3105/1, Infrastructure-mounted Pantograph (Cross-

c. Rail) Connection

d. SAE J1772: SAE Electric Vehicle and Plug-in Hybrid Electric Vehicle Conductive Charge Coupler, most recent edition.

e. NFPA 70: National Electric Code (NEC), most recent edition.

f. NFPA 70E: Standard for Electrical Safety in the Workplace, most recent edition

g. Underwriter's Laboratory UL 2202, Standard for Electric Vehicle (EV) Charging System Equipment, most recent edition.

h. Underwriter's Laboratory UL 2231-1, Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements

i. Underwriter's Laboratory UL 2231-2, Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems.

j. ANSI/IEC 60529: Degrees of Protection Provided by Electrical Enclosures (IP Code), most recent edition.

k. IEC 61851-1; 23; 24: Electric Vehicle Conductive Charging System, most recent edition.

l. IEC 61000-6-2: Electromagnetic Compatibility (EMC) – Part 6-2: Generic Standards – Immunity Standard for Industrial Environment.

m. 29 CFR 1910.147: General Environmental Controls, The Control of Hazardous Energy (Lockout/Tagout), as enforced by OSHA, most recent edition.

n. International Electrotechnical Commission (IEC) 60309, most recent edition.

o. Federal Communications Commission (FCC) rules and regulations, as applicable.

p. Open Charge Point Protocol OCPP 2.0 or higher to allow charger control and monitoring by a third-party charge management system

4. Components:

a. Power Cabinet(s).

b. All components, interconnecting cabling and conduits/ducts between components, software, and accessories for a fully and properly operational device.

B. Capacities and Dimensions:

1. Cabinet equipment unit performance to allow total output charge power, DC: Nominal 150 kilowatts (kW), minimum capable to charge a 675kWh battery electric bus (BEB) from a ten percent usable by vehicle state of charge to ninety five percent usable by vehicle state of charge in a consecutive four-hour period from a single dispenser.

a. Systems that combine power outputs from two or more separate standalone cabinets to produce the total output charge power of the nominal 150kW minimum and charger time are acceptable and considered equivalent to a single 150kW cabinet unit.

b. Systems that employee a single larger kW cabinet with multiple outputs to dispensers that produce the total output charge power of the nominal 150kW minimum and charger time are acceptable and considered equivalent to a single 150kW cabinet unit.

c. Quantity of inverted pantographs charging dispensers in bus parking areas, output charge power from entire overhead DC charging system to be capable of charging full quantity of overhead electrically charged vehicles identified on the project drawings in a single consecutive (8) eight-hour period minimum inclusive of charge management peak power reductions, state of charge (SOC) diversity factor as described in addendums and other proposed and verifiable max charging power reduction systems. Additional chargers provided in maintenance and services bays are not to be factored in to charging systems ability to charger the identified BEB fleet size in an eight-hour period.

2. Output voltage range: 200-1,000 volts, DC.

3. Rated DC output current range: 3-250 Amps, bi-directional.

4. Operating temperature range: -22 degrees Fahrenheit (F) to 113 degrees F.

5. Input connections: 3 phase plus protected earth ground wire

6. Input power rating: nominal 205 kVa (full load) / 100 VA (idle)

7. Input AC line-line voltage range: 480 VAC +6/-13%
8. Input AC phase current: nominal 283 amps, maximum / 385 amps fused.
9. Power factor, total harmonic distortion: 0.95, minimum.
10. Power conversion efficiency at full load: 96 percent, minimum.
11. Dielectric withstand: 3,000 volts, root mean square (RMS).
12. Network connection: 4G/LTE modem, minimum, utilizing Open Charge Point Protocol (OCPP) 2.0 or later network communication.
13. Protection: IP54 and IK 10 or equivalent NEMA rating.
14. Operational noise level: 85 decibels, maximum.
15. Overall dimensions, power cabinet(s), maximum nominal:
    a. Width: 40 inches.
    b. Depth: 40 inches.
    c. Height: 91 inches.
    d. Weight: 2,200 pounds.

C. Features and Construction:

1. Each electrical cabinet to be a standalone unit capable of meeting the specification herein. The cabinet shall include capability for entry of alternating current (AC) electrical supply, main isolation transformer cabinet, AC to DC power conversion, AC grid coupling and protective devices, DC output coupling and protective devices, controller for charger circuit and the communication equipment, and forced-air over coolant chiller functions.
2. Capable of being connected to power supply grid or low voltage power distribution station.
3. Charge cabinet configurable to support either multiple overhead pantograph dispensers or plug-in dispensers. Individual cabinet not required to be capable of being connected to and simultaneously or concurrently energizing a mix of both pantographs and plug-in dispensers. Concurrent charging is preferred but sequential charging systems in bus parking areas will be considered based on submitted charging performance. Concurrent charging only to be used at maintenance bay plug-in dispensers.
    a. On concurrent controlled and powered dispensers, shared dispensers connected (dispenser A, dispenser B+), to a single DC power cabinet, the nominal output (voltage, current, power, charging telemetrics, and controls) to the simultaneously connected remote dispensers will be split from the DC power cabinet and, as controlled by the DC power cabinet's shared dispenser charging priority system, power one remote dispenser unit (dispenser A) up to the nominal maximum outputs while simultaneously and concurrently providing minimal or remaining DC

power cabinet's output to the other shared connected remote dispenser units (dispenser B+) until all BEBs connected to the shared charging dispensers are fully energized. During this concurrent controlled charging process, after BEBs initial dispenser connection, plug-in or pantograph connection at the beginning of the charging process, no manual re-plugging / disconnection, re-plugging / reconnection, re-paring or wireless connection of charge connector or pantograph will be necessary.

b. On sequentially controlled and powered dispensers, shared dispensers connected to a single DC power cabinet, the nominal output (voltage, current, power) to the simultaneously connected remote dispensers (dispenser A, dispenser B+) will be shifted from the DC power cabinet and, as controlled by the DC power cabinet's shared dispenser charging priority system, power one remote dispenser (dispenser A) unit up to the nominal maximum outputs while not providing output to any other connected shared remote dispenser units (dispenser B+). As controlled by the DC power cabinet's shared dispenser charging priority system, the DC power cabinet's output will then automatically switch and shift the output (from dispenser A) to another connected and shared remote dispenser unit (dispenser B) up to the nominal maximum outputs (to dispenser B) while not providing output to any other connected shared remote dispenser units (dispenser A, C+). The shifting of power output between the various connected shared remote dispenser units continues until all BEBs connected to the shared charging dispensers are fully energized. During this sequential controlled charging process, after BEBs initial dispenser connection, plug-in or pantograph connection at the beginning of the charging process, no manual re-plugging / disconnection, re-plugging / reconnection, re-paring or wireless connection of charge connector or pantograph will be necessary.

4. Capable of being configured to operate dispenser configuration and energizing a minimum quantity of:

   a. Two (2) Charging Pantograph, Inverse, Facility mounted Equipment Mark Number: 8020 and capable of providing charging power to each pantograph either sequentially or concurrently. Includes all interconnecting electrical cabling, data cabling, conduit / ducts, distribution boxes, DC switches (internal to charging cabinet and external from charging cabinet) and all other components necessary for interconnection.

   b. Four (4) Remote Plug-In Dispenser Equipment Mark Number: 8025 and capable of providing charging power to each plug-in dispenser concurrently. Includes all interconnecting electrical cabling, data cabling, conduit / ducts, and all other components necessary for interconnection.

5. Intended for, and fully capable of, installation in an outdoor environment, with a thermal and water-resistant enclosure. Cabinet(s) shall include an integral raised base for protection of equipment and fastening to sub-structure. Raised base should allow for mounting to an elevated steel support frame and not require direct to concrete pad installations.

6. Includes an on-board transformer / rectifier, allowing the power cabinet to receive an alternating current (AC) input power connection from the facility electrical supply and convert it to DC electrical output to the charge box and connected bus.

7. Includes a chiller unit capable of maintaining manufacturer's required temperature for power conversion components. Chiller shall include protective air intake grill(s) and fan(s).

8. Include internal DC distribution box / DC Switch to control and manage DC outputs within the charger cabinet enclosure.

    a. Charging cabinets relying on DC distribution boxes / DC switches that are external to the charging cabinet are acceptable but all components of the external multiple DC output control / management system are to be supplied and installed as part of the charging cabinet system including additional conduits, power and control wiring, DC distribution boxes / DC switches, mounting and supporting structural elements to locate the DC distribution boxes / DC switches from the building structure.

        1) All additional structural loading (weights and reactions), physical space requirements (sizes, clearances, requirements for manual interactions) of an external to charging cabinet DC distribution box / DC Switch to be included with initial approval submission of charging system by the City. Additional charging system components, installation labor, software, or physical controls added to approved charging cabinet system that were not presented as required in initial charging cabinet system review are grounds for negating original submission approval.

9. Unit is designed to be installed with multiple similar mark 8012 charging cabinet units in a dense location and vent locations of cabinets to facilitate close proximity installations between similar cabinets to sides and rear of unit.

10. Include forklift pockets at base of unit or lifting lugs on top and or side of unit. Units that utilize no mechanical connections for lifting and rely solely on wrapped / strapping connections around unit cabinet case to install, position or remove unit are not acceptable.

11. Controller shall include the protective ground connection, the DC output voltage connections, and the supervisory control components.

12. Communications portion of the controller equipment shall be capable of being connected to other computer networks, including networks with charge management systems, through Ethernet and/or wireless connection. The power cabinet shall be capable of communicating to that charge management system by means of an open source, non-proprietary, communication protocol.

13. Includes a cellular antenna, 4G/LTE or better, enabling connection to cellular networks.

14. Includes on-board computer and/or programmable logic devices, software, and wireless communication devices that, at a minimum, also provide the following functionality to the power cabinet:

    a. Pantograph Dispenser

        1) To wirelessly detect BEB mounted transponders within each attached Facility Mounted Inverse Charging Pantograph's (Pantograph) operational area and ignore transponders outside each attached Pantograph's operational area

including similar transponders located on all four sides surrounding transponder installation. This process shall be automatic, and performed at system start-up / system re-start, and at programmable intervals and times, up to and including near continuous detection.

2) To initiate wireless signal with, receive wireless signal from, and establish a wireless communication protocol with any bus in the Owner's BEB fleet that is determined by the system as being parked within the pantograph's operational area, and that has an on-board transponder (by others).

3) To communicate with, and automatically cause each attached individual Pantograph to descend once a BEB has been identified, communication established, and has been detected as 'parked' within that Pantograph's individual operational area. The equipment shall ignore BEBs passing through a Pantograph's operational area.

4) Automatically cause an attached Pantograph to retract upon receiving a 'disengage' signal from a connected BEB that is parked in that Pantograph's operational area,

5) Automatically cause each Pantograph to retract to a 'fail safe' state when receiving pertinent error codes, and upon facility power outages and major fluctuations. 'Fail safe' Pantograph retraction shall occur for individual isolated Pantographs and system wide for all Pantographs, depending on error code.

6) Automatically terminate wireless communication with any BEB after a pre-programmed time, and after detecting the BEB is no longer in operational range, or when the BEB is disengaged.

b. Plug-In Dispenser

1) To initiate signal with, receive signal from, and 'handshake' with any bus connected by means of the charge connector while charge connector is plugged into the charging port of a bus.

2) To automatically start, stop, and regulate any charge to any bus battery connected by means of the charge connector while charge connector is plugged into the charging port of a bus.

3) To communicate wirelessly collected bus information to a charge management system regardless of whether the charge connector is plugged into or disconnected from the charging port of a bus.

c. Once wireless communication is established with the bus, to communicate with, request and receive from the BEB the following information: bus identification and battery information such as charge status, temperature, etc.

d. Information collected shall be stored, and able to be transmitted to a charge management system.

e. To automatically start, stop, and regulate any charge to any bus battery connected by means of the Facility Mounted Inverse Charging Pantograph or charge connector.

f. To request, receive, and store bus battery information such as ID, charge status, temperature, etc. from the bus by means of wireless communication with the bus being charged.

g. To allow Owner's charge management system to control and report a minimum feature set of each charging cabinet in real time:

1) Cabinet connected dispenser / pantograph status – connected to a vehicle / not connected to a vehicle

2) Cabinet on (allowing charging to occur) / off (not allow charging to occur)

3) Total cabinet power output

4) Report vehicle ID connected to each dispenser / pantograph connected to DC charging cabinet

5) Cabinet not operational / unit issuing trouble code

15. Lock-out / Tag-out functions – preference is for AC input to charging cabinet to enter at a charging cabinet internally integrated disconnecting means compliant with NEC 625.42 and not require a separate external disconnect. Systems requiring external disconnects will be considered but requirement of need for separate disconnect means and inclusion of external disconnects are required on all submitted product data and project specific shop drawings and charger layouts. Lock-out / Tag-Out functions shall include, at a minimum, the following:

a. AC supply entry cabinet shall not be allowed to open under live grid conditions and shall only be allowed to open only if the main power supply to the charger is locked out.

b. Main transformer cabinet(s) and AC/DC converter cabinet shall not be allowed to open under live grid conditions and shall only be allowed to open if there are no live grid conditions to the charger and if the main power supply breaker is locked out.

c. The chiller cabinet shall not be allowed to open while the charger is energized but shall only be allowed to open if the charger is de-energized and the auxiliary switch is locked out.

16. Emergency Stop Button directly accessible on the outside of the power cabinet. Allows for emergency stopping of the charger and de-energizing of the charging system.

17. Group Remote Emergency Stop Button capable. Allows for connections to auxiliary emergency stop buttons remotely located in the facility and connected to multiple equipment mark 8012 charging cabinet units to stop / reset charging cabinet units as a group. Remote emergency stop reset should not require individual resetting of mark 8012 charging cabinet's factory installed cabinet integrated emergency stop button after remote emergency stop button reset.

18. Remote manual override controls for the Pantograph, capable of extending or retracting the Pantograph on demand and re-start charging wireless validation and the charging process without the need to physically re-park or reset individual vehicle parking brakes. Override controls shall include a key switch and keys for operation.

19. Includes all other components for necessary and proper function of the unit including, but not necessarily limited to, metal support frame and protective panel enclosure, foundation support base, air intake and exhaust vents, forced air cooling fans, air filters, grounding devices and connections, cables, cords, connectors, etc.

D. Finish: Exterior panels of power cabinet to have protective finish to prevent corrosion of enclosure. Provide in Owner's choice of manufacturer's standard colors.

E. Accessories:

1. Refer to Equipment Mark Number 8020 for Charging Pantograph.

2. Refer to Equipment Mark Number 8025 for Remote Plug-In Dispenser.

3. Coolant, in quantity and type as required by manufacturer.

4. Fabricated steel support stand, capable of elevating and properly supporting the DC power cabinet unit. Steel shall be hot-dip galvanized in accordance with ASTM A123 Standard. Refer to drawings for details.

5. Emergency Stop Button (E-Stop) – directly accessible on the outside of the DC power cabinet. Allows for emergency stopping / de-energizing output of all remote dispenser units connected to a single DC power cabinet whose E-Stop button is activated

6. Group Remote Emergency Stop Button (E-Stop) – in quantities and locations as shown on the drawing. Allows for emergency stopping / de-energizing output of all remote dispenser units connected to a multiple DC power cabinets in groupings as shown on the drawings.

7. External DC Output Distribution Box / DC Output switches if required

F. Utilities:

1. Electrical: 480 VAC, 3 Phase, 60 Hz, nominal 283 amps maximum / 365 amps, maximum inrush (fused).

2.2 CHARGING PANTOGRAPH, INVERSE, FACILITY MOUNTED EQUIPMENT MARK NUMBER: 8020

A. General:

1. Description: An overhead facility mounted retractable pantograph capable of automatically connecting to the roof mounted charging contacts of buses in the Owner’s battery electric bus (BEB) fleet, and then automatically charging the connected bus utilizing direct current (DC) electrical power via the connected Charging Cabinet, Battery Electric Bus, 150kw DC Power, Equipment Mark Number: 8012.

2. Coordination: Specification information indicated herein is intended as general requirement only. Final design of the system shall be by the manufacturer and shall be presented in the project specific shop drawings in coordination with the Charging Cabinet, Battery Electric Bus, 150kw DC Power, Equipment Mark Number: 8012 as a fully coordinated, complete design.

3. Compliance: The equipment and final design shall comply with the most current editions of all applicable local, state, and federal codes and regulations, including, but not limited to, those listed below.

    a. SAE International Standard J3105, Electric Vehicle Power Transfer System Using a Mechanized Coupler, most recent edition.

    b. SAE International Standard J3105/1, Infrastructure-mounted Pantograph (Cross-Rail) Connection

    c. NFPA 70: National Electric Code (NEC), most recent edition.

    d. Underwriter's Laboratory UL 2202, Standard for Electric Vehicle (EV) Charging System Equipment, most recent edition.

    e. Underwriter's Laboratory UL 2231-1, Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements

    f. Underwriter's Laboratory UL 2231-2, Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems.

    g. ANSI/IEC 60529: Degrees of Protection Provided by Electrical Enclosures (IP Code), most recent edition.

    h. ANSI/IEC 61851-23: Electric Vehicle Conductive Charging Systems, DC Electric Vehicle Charging Station.

    i. 29 CFR 1910.147: General Environmental Controls, The Control of Hazardous Energy (Lockout/Tagout), as enforced by OSHA, most recent edition.

    j. International Electrotechnical Commission (IEC) 60309, most recent edition.

    k. Federal Communications Commission (FCC) rules and regulations, as applicable

B. Capacities and Dimensions:

1. Pantograph:

    a. Rated Voltage: 1,000 volts, DC, minimum

    b. Rated charging current: 250 Amps (A), minimum.

    c. Operating temperature range: -22 degrees Fahrenheit (F) to 150 degrees F

    d. Pantograph operating range, from partial to full extension (nominal): 30 inches to 90 inches

2. Pantograph controller and motor:

    a. Supply voltage: 24 volts, DC

    b. Current: 40A nominal.

    c. Pantograph contact force with vehicle: 112 foot-pounds, maximum

d. Total time to raise pantograph from full extension to full retraction: 5 seconds, maximum.

e. Total time to lower pantograph from full extension to full retraction: 5 seconds, maximum.

f. Compensation of pantograph to the parked bus, nominal:

1) X-axis: 30 inches to the vertical axis

2) Y-axis: +/- 12 inches to the transversal axis

3) Z-axis: +/- 12 inches to the longitudinal axis

3. Compensation of angles: 5 degrees each direction

4. Wireless Communication System:

a. Wireless system communication: CAN bus with SAE J1939 communication protocol.

b. Wireless data interface between antenna and antenna controller: RS-232, Ethernet

c. Communication protocol between antenna and antenna controller: Serial.

d. Wireless antenna:

1) Dimensions, nominal: 12 inches, 9 inches, 6 inches.

2) IP Rating: IP 66 or equivalent NEMA rating

3) Specified range: Capable of detecting bus mounted system transponder within an 8-foot radius of the antenna. Capable of transmitting to and receiving information from any bus mounted system transponder with the 8-foot radius from the antenna. Able to ignore similar surrounding transponders directly adjacent to but outside of the 8-foot radius.

5. Wireless Antenna Controller:

a. Dimensions, nominal: 36 inches, 28 inches, 16 inches.

1) 1) IP Rating: IP 66 or equivalent NEMA rating

6. Wireless Transponder and Data Collector:

a. Connect to vehicle via SAE J1939 connectors.

7. Overall dimensions, nominal:

a. Length: 57 inches nominal maximum

b. Width: 40 inches nominal maximum

c. Height: 42 inches nominal maximum in retracted position

d. Necessary clearance in x-axis: 2 inches

e. Necessary clearance in y-axis (length of rails + clearance): 25 inches + 2 inches

8. Dimensions of interface, nominal:

a. Length (total): 57 inches

b. Length (single contact): 40 inches

c. Width: 30 inches

9. Pantograph positions, from mounting plane (underside of facility structure), as noted on drawings

C. Features and Construction:

1. Pantograph and Pantograph Controller:

a. 'Inverted' pantograph down design mounted to the facility structure and extending down to contact vehicle mounted charging contact bars.

b. Pantograph and pantograph controller shall have integrated fail-safe functions. Functions shall include automatic full retract of the Pantograph upon error code, power loss, or other system malfunction.

c. Independently insulated multi-pole contacts: positive, negative, protected earth (ground) and control pilot.

d. Zero electrical potential frame components.

e. Includes flexible head and spring-loaded connection allowing for compensation of the pantograph system.

f. Capable of raising and lowering the pantograph to pre-programmed height/positions.

g. Capable of both quick duration contact fast-charge and long duration depot charging.

h. Includes an internal sensor to provide a soft-stop landing on the bus roof rails.

i. Capable of being de-energized by charging cabinet e-stop systems (cabinet mounted e-stop and additional remote group e-stops)

2. Wireless Communications System Antenna and Antenna Controller: Shall be mounted in a fixed position near the pantograph and contain a programmable logic controller, or similar computing device, along with all accessories (such as cooling devices) necessary for proper operation. Together, the Antenna and Antenna Controller shall be able to perform the following functions:

a. The Controller shall be able to compute relative distances of bus mounted transponders from the Antenna.

b. The Controller shall be able discriminate between bus mounted transponder distances and acknowledge and communicate with any bus mounted system transponder located only within the programmed Pantograph operational area. Transponder signals outside of the operational area shall be ignored.

c. The Controller shall be able to instantly compare each Bus Identification Number received from a bus transponder signal within the specified range to a central Bus Identification Number Authorization File (or similar). The Controller shall continue to try and communicate with bus transponders allowed by the Authorization File and shall ignore signals from bus transponders disallowed by the Authorization File.

d. Upon initial detection of any bus transponder within the Pantograph operational area, and allowed by the Authorization File, the Controller will immediately search for confirmation signals that the same bus transponder is still within the operational area. If confirmation signals are detected, then the "handshake" communication protocol shall be established between the Controller and the transponder, via the Antenna. If confirmation signals are not detected, then no communication protocol shall be established, and the Antenna and Controller shall continue to search for a transponder signal within the operational area.

e. Upon successful establishment of the "handshake" communication protocol, a communication link shall be established to enable the Controller to read information from the bus mounted Transponder via wireless communication through the Antenna. For the duration of the communication link, the antenna will only accept information from the connected transponder. All other transponder signals shall be ignored.

f. During the life of the communication link, the Controller shall periodically ping the linked transponder and confirm the transponder is still within the specified range of the Antenna and Controller. If so, the communication link shall not be terminated. If not, the Controller shall immediately terminate the link, and begin to search for a transponder signal within the specified range.

g. Controller shall have a physical and/or wireless data connection to the Owner's network, and capable of periodically accessing and reading the Owner's Bus Identification Number Authorization File. Periodic access shall be programmable and shall occur at regular intervals.

h. Controller shall be capable of establishing a secure internet connection through the Owner's network to regularly and periodically download software updates.

3. Wireless Communications System Software: Programs as necessary for functioning of each individual Antenna Controller, as well as a central software program for managing multiple Antenna Controllers within a single site. Central software program shall be web based, or compatible with Owner's Windows compatible PCs.

4. Includes all other components for necessary and proper function of the unit including, but not necessarily limited to, metal support frame and protective panel enclosure, foundation support base, grounding devices and connections, cables, cords, connectors, etc.

D. Finish: Corrosion and wear resistant finish in Owner's choice of manufacturer's standard colors.

E. Accessories:

1. Modular metal framing system to provide support and stability to items suspended from facility structure. Configuration, quantity and spacing to be determined as part of contractor's final design.

2.3 REMOTE OVERHEAD DISPENSER EQUIPMENT MARK NUMBER: 8025

A. General:

1. Description: A stationary upright cabinet with a flexible power cord and corded handheld plug (charge connector) capable of being manually connected to the charging port of buses in the Owner's electric bus fleet, and then automatically charging the connected bus utilizing DC electrical power output generated from a connected Mark Number 8012 DC Power Cabinet.

2. Compliance: The equipment and final design shall comply with the most current editions of all applicable local, state, and federal codes and regulations, including, but not limited to, those listed below.

a. NFPA 70: National Electric Code (NEC), most recent edition.

b. SAE J1772: SAE Electric Vehicle and Plug-in Hybrid Electric Vehicle Conductive Charge Coupler, most recent edition.

c. ANSI/IEC 60529: Degrees of Protection Provided by Electrical Enclosures, most recent edition.

d. Open Charge Point Protocol OCPP 2.0 or higher to allow charger control and monitoring by a third-party charge management system.

e. NFPA 70E: Standard for Electrical Safety in the Workplace, most recent edition.

f. CFR 1910.147: Code of Federal Regulations, Occupational Safety and Health Standards, General Environmental Controls, The Control of Hazardous Energy (Lockout / Tagout), most recent edition.

B. Capacities and Dimensions:

1. Output voltage range at the remote dispenser, refer to Equipment Mark Number: 8012

2. Output current at the remote dispenser, refer to Equipment Mark Number: 8012

3. Output power at the remote dispenser, refer to Equipment Mark Number: 8012

4. Overall dimensions, remote dispenser, nominal:

a. Width: 24 inches.

b. Depth: 9 inches.

c. Height: 32 inches.

d. Weight: 60 lbs (including weight of cord and charge connector below)

e. Cable length: 22 feet - nominal.

f. Charging Connector – SAE J1772 CCS Level 2 plug-in connector with strain relief

C. Features and Construction:

1. Remote dispenser unit shall be connected to and receive power output (voltage, current, power, charging telemetrics and controls) from the DC power cabinet, then regulate and transmit that output to the bus, when manually connected by the charging connector.

   a. Include glass fiber (or similar) communications lines between the DC power cabinet and remote dispenser, as well as all necessary protective conduits, seals, and fasteners.

   b. Remote dispenser enclosure shall be rated IP65 protection, per ANSI/IEC 60529.

2. Dispenser cabinet to be mounted in locations shown on plans but anticipated to be mounted to existing facility structural elements or being suspended from overhead structural frame supported by existing facility structure. Ground mounted support stands for plug-in dispensing cabinet located in Maintenance and Service bays are not to be utilized unless specifically call for on plans.

3. Charging connector and attached cord shall be capable of being manually connected to, and disconnected from, the bus charger. Charging connector shall conform to SAE J1772 SAE standard.

4. Charger Status Indicator Light on bottom or side of remote dispenser cabinet and visible to an operator below the plug-in dispenser cabinet when mounted overhead. If charge status indicator light is standard on the top of the cabinet and cabinet orientation does not allow a user below to see the cabinet, providing a secondary cabinet mounted or adjacent mounted to facility structure remote charger status indicator light is acceptable. Three (3) color or more to indicate via color and blinking the following:

   a. Charger Energized and Ready

   b. Charger Connected and Charging

   c. Charger Connected and Charge Complete

   d. Charger Not Ready / Not Charging / Warning Indicator

5. Coordinate installation of the dispenser cord, the dispenser cabinet, and the charging connector in the field so that, once installed, there is minimal bending and/or twisting of the dispenser cord, or ‘flipping’ of the charge connector, when personnel attempt to plug the charge connector into a battery electric bus.

6. Emergency Stop Button directly accessible on the outside of the remote dispenser box. Allows for emergency stopping of the charger and de-energizing of the plug-in charging system.

7. Group Remote Emergency Stop Button capable. Allows for connections to auxiliary emergency stop buttons remotely located in the facility and connected to multiple equipment mark 8025 charging cabinet units to stop / reset charging cabinet units as a group. Remote emergency stop reset should not require individual resetting of mark 8025 charging cabinet's factory installed plug-in cabinet integrated emergency stop button after remote emergency stop button reset.

D. Finish: Exterior panels of charger box to have protective powder coat finish in Owner's choice of manufacturer's standard colors.

E. Accessories:

1. Modular metal framing system to provide support and stability to items suspended from existing horizontal or vertical structural facility elements. Configuration, quantity and spacing to be determined as part of contractor's final design. Kindorf or equal.

2. Cord hook / rack to store and secure flexible power cord and charge connector at nominal five foot above finish floor when not in use.

3. Remote secondary charge status indicator light as needed.

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match and/or non-interference with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

3.2 INSTALLATION

A. Perform work under direct supervision of foreman or construction superintendent with authority to coordinate installation of scheduled equipment with design team.

B. Coordinate work with Manufacturer's Representative indicated in Part 1.02 of this specification section

C. Install equipment in accordance with plans, approved shop drawings, and manufacturer's instructions:

1. Initial City mockup for positioning pantograph Equipment Mark: 8020: At a parked bus charging position to be identified by the City, provide installation mockup of DC charging cabinet connected to an overhead pantograph, wireless communications system to allow for testing and proofing of DC charging system component mounting heights and overhead locations or components relative to parked bus. Mock-up to allow for in- field adjustment of individual charging components, including but not necessarily limited to, electrical junction boxes, mounting and support brackets, and pantograph orientation and auxiliary control connection points. In field adjustments shall consist of those necessary to allow the overhead pantograph to be deployed

automatically when a bus is properly parked in the charging position and wireless communications system is engaged. Mock-up shall be reviewed and approved by design team and the City prior to installation of other overhead charging components. Overhead components purchased or installed prior to mock-up approval shall be modified to conform to the approved mock-up without additional material or labor charges to the City

2. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.

3. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

4. Anchorage: Attach DC charging cabinet equipment securely to floor or elevated support frame, in conformance with manufacturer's instructions and as directed by design team, to prevent damage resulting from inadequate fastening and to resist seismic movement. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specification in the presence of the design team using acceptance procedures provided by the manufacturer.

B. Final testing and post installation inspection are required and shall be performed by the manufacturer or the manufacturer’s designated representative only. Final testing and inspection shall not be performed by the installer, unless the installer is also the manufacturer.

C. Manufacturer / Installer shall provide a testing procedure and checklist that indicates proper testing of all major functions of the equipment. This procedure and checklist will form the basis of the testing process.

3.4 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify design team for acceptance inspection.

3.5 TRAINING

A. Direct the technical representative to provide specified hours of training to the City’s designated maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. CHARGING CABINET, BATTERY ELECTRIC BUS, 150KW DC POWER Equipment Mark Number: 8012

a. Hours Required: 16

2. CHARGING PANTOGRAPH, INVERSE, FACILITY MOUNTED Equipment Mark Number: 8020

   a. Hours Required: Included in training for Equipment items listed above.

3. REMOTE PLUG-IN DISPENSER Equipment Mark Number: 8025

   a. Hours Required: Included in training for Equipment items listed above.

B. Obtain, from technical representative, a list of the City's personnel trained in equipment operations and maintenance.

C. Provide a Windows compatible movie file format recording on USB stick of the training session. The training movie can be a recording of a live session or a produced training video

END OF SECTION

Division 6 – Testing & Commissioning and Operational readiness

POTRERO YARD MODERNIZATION PROJECT

Exhibit 18:

Technical Requirements

Division 06:
Testing & Commissioning and Operational Readiness

November 06, 2024

FINAL DRAFT

TABLE OF CONTENTS

6. TESTING & COMMISSIONING AND OPERATIONAL READINESS

6.1 Introduction

The purpose of Commissioning is to provide a systematic process of assuring by verification and documentation, from the design phase and throughout the Term, that all Project systems perform interactively in accordance with the Contract Documents. The parties acknowledge that because many Project systems are integrated, a deficiency in one or more components can result in sub-optimal operation and performance among other components. Remedying these deficiencies can result in a variety of benefits including: (i) improved productivity of Project users; (ii) lower utility bills through energy savings; (iii) increased satisfaction of Project users; (iv) enhanced environmental conditions, health conditions and comfort of Project users; (v) improved Project system and Project Equipment function; (vi) improved Project operation and maintenance; (vii) increased safety for Project users; (viii) better Project documentation; (ix) shortened occupancy transition period; and (x) significant extension of Project equipment and Project systems life cycles.

This Division 6 sets forth the minimum Commissioning requirements Principal Project Company is required to comply with.

6.1.1. Definitions

All capitalized terms used in this Division 6 shall have the meaning given to them in this Section 6.1.1 or, if not defined here, in Exhibit 1 to the Agreement.

Commissioning or Building Commissioning: A process consistent with ANSI/ASHRAE/IES Standard 202-2018 that focuses upon verifying and documenting that the Infrastructure Facility and all its systems and assemblies are planned, designed, installed, and tested to meet the Contract Documents.

Commissioning Issues and Resolution Log: Has the meaning set forth in Section 6.5.2.3 of this division.

Commissioning Provider (CxP): The entity that leads, plans, schedules, and coordinates the Commissioning team to implement the Commissioning process.

Commissioning Plan: The plan prepared, submitted and updated by Principal Project Company that outlines the organization, schedule, allocation of resources and documentation requirements of the Commissioning process that meets the requirements of Section 6.5.2.1 of this division, as approved by the City.

Commissioning Report: Has the meaning set forth in Section 6.5.3.7 of this division.

Commissioned Systems: Has the meaning set forth in Section 6.4 of this division.

Commissioning Team: The individuals who, through coordinated actions, are responsible for implementing the testing and Commissioning process as described in the Commissioning Plan. The team shall include Principal Project Company, City, D&C Contractor representatives, CxP, design professionals, Contractors, and manufacturer's representatives.

Monitoring-Based Commissioning (MBCx): Has the meaning set forth in Section 6.7 of this division.

Ongoing Commissioning Plan: Has the meaning set forth in Section 6.5.4.5 of this division.

Operational Readiness Working Group (ORWG): Has the meaning set forth in Section 6.8 of this division.

Operational Readiness (OR): Has the meaning set forth in Section 6.8 of this division.

Operational Readiness Plan: Has the meaning set forth in Section 6.8 of this division.

Seasonal Testing: Has the meaning set forth in Section 6.5.4.2 of this division.

Systems Manual: Has the meaning set forth in Section 6.5.4.1 of this division.

6.2 Standards and Guidelines

The Infrastructure Facility shall be Commissioned in compliance with all, but not limited to, the latest editions of codes and standards listed below:

ASHRAE Standard 202- 2018; “Commissioning Process for Buildings and Systems”.

ASHRAE Guideline 0-2019; “The Commissioning Process”.

ASHRAE Guideline 1.1-2007; “HVAC&R Technical Requirements for the Commissioning Process”.

ASHRAE Guideline 1.4-2019; “Procedures for Preparing Facility Systems Manuals”.

ASHRAE Guideline 4-2019; “Preparation of Operating and Maintenance Documentation for Building Systems”.

NECA 90-2015; “Commissioning Building Electrical Systems”.

NFPA 3-2021; “Standard for Commissioning of Fire Protection and Life Safety Systems”.

NFPA 4-2024; “Standard for Integrated Fire Protection and Life Safety System Testing”.

ASTM E2813 – 2018; “Standard Practice for Building Enclosure Commissioning.

ASTM E2947 – 2021a; “Standard Guide for Building Enclosure Commissioning”.

NIBS Guideline 3-2012; “Building Enclosure Commissioning Process BECx”

USGBC, Leadership in Energy and Environmental Design (LEED™).

CALGreen

Manufacturer guidelines for equipment testing.

NFPA 110 - 2022 Edition: “Testing of Emergency Power Systems.”

NFPA 21 - 2020 Edition: “Testing of Fuel Oil Systems.”

6.3 LEED

Principal Project Company is required to file for and achieve a gold level certification for the Project under the Leadership in Energy and Environmental Design (LEED™) V4 (or the most current fully released version of LEED) program, as detailed in Division 3, Section 3.4, of the Technical Requirements. As part of the LEED™ Gold certification, Principal Project Company shall meet the Energy and Atmosphere prerequisite, “Fundamental Commissioning and Verification” of the building energy systems and shall attain the “Enhanced Commissioning” credits in full (6 points).

In general, the Commissioning process as described in this Division 6 will meet and exceed LEED™ and CALGreen certification requirements.

6.4 Commissioned Systems

The Infrastructure Facility shall be delivered on a full turn-key basis in accordance with the Contract Documents, including the Commissioning of all systems, assemblies, and equipment provided and installed by Principal Project Company, which shall include:

- Mechanical, including HVAC&R equipment and controls;
- Plumbing, including domestic hot water systems, fire suppression system, pumps, controls and compressed air system; electrical, including service, distribution, lighting, and controls, including daylighting controls;
- Building Automated System;
- Emergency and standby power systems;
- Renewable energy systems (if applicable);
- Audio and visual systems;
- Security systems;
- Smoke control and fire alarm systems;
- Building enclosure systems and assemblies;
- SFMTA O&M Facilities and items on the Equipment List including but not limited to:
  - Bus maintenance lifts;
  - Traction power systems;
  - Compressed air connections to hose reels and process equipment for tire shop, paint shop, sheet metal shop, preventive maintenance bays, lower-level work area (LLWA) preventive maintenance bays, bus wash and service areas;
  - Loading dock systems;
  - IT room cooling;
  - Circulation fans;
  - Gear oil, differential fluid, coolant and power steering tank systems and tank monitoring system;
  - Used coolant collection and tank system, including monitoring;
  - Used oil collection and tank system, including monitoring;
  - Bus wash equipment and monitoring system;
  - Security management system;
  - Bus garage gas detection equipment;
  - Fire command center; and
  - Bridge crane – 5 ton

(together the “Commissioned Systems”).

6.5 Commissioning Provider (CxP)

Principal Project Company shall engage the services of a City-accepted CxP having technical background and in-depth expertise with the Commissioning process including verification techniques, functional performance testing, system equipment and operation and maintenance knowledge. The CxP must be an entity that specializes in building Commissioning and shall be commercially independent of any person already engaged by Principal Project Company for provision of the Contract Services.

The CxP shall bring a total building Commissioning perspective to the Project and be knowledgeable in (and where applicable, federal, State and local): (i) building fire codes; (ii) water-based extinguishing systems; (iii) detection systems; (iv) LEED; (v) energy codes, energy efficient design strategies; (vi) building envelope materials, components, assemblies, and systems; (vii) high performing building management and controls; and (viii) other building requirements.

The CxP will take the lead role in coordinating the entire Commissioning process on behalf of Principal Project Company, from preparation of the Commissioning Plan through to the completion of Commissioning. To fulfil all Commissioning requirements, the CxP may be one or more firms with special skillsets working together. In all cases, however, the CxP must be led by single firm with a designated individual responsible for all Commissioning work.

The CxP shall be Principal Project Company's only representative with respect to the Commissioning process, and shall be the only point of contact in respect of Commissioning matters for the City throughout the Commissioning process.

The CxP shall have specialized experience in Commissioning recently constructed buildings of similar complexity, size and type to the Infrastructure Facility. In the event that Principal Project Company proposes a CxP that the City reasonably believes cannot meet the requirements stated in this Division 6, Principal Project Company shall propose an alternative CxP that the City accepts. If the parties are unable to agree with the CxP, the CxP shall be selected in accordance with the dispute resolution procedures set forth in Article 18 (Partnering; Contract Dispute Procedures) of the Agreement.

Principal Project Company shall propose a person acceptable to the City who can act as a substitute for the named CxP in the event that the CxP is unavailable or otherwise unable to complete this role.

6.6 Commissioning Scope

For the avoidance of doubt, all Commissioning procedures, processes, activities, and reporting will apply to all Commissioned Systems, including SFMTA O&M Facilities. The CxP shall report to Principal Project Company but be available to answer questions from the City and will coordinate with the City on site visits, testing activities, and trainings.

6.6.1. Summary

Principal Project Company shall hire a CxP to perform the scope contained in this Division 6, as well as perform testing required elsewhere the Technical Requirements, such as Division 4 (Supplemental Design Criteria).

The CxP shall perform the following tasks, which are further detailed in subsequent sections:

- Review design documentation including the BODR;
- Prepare, update, implement, and comply with the Commissioning Plan;
- Confirm integration of Commissioning activities into the Project Schedule;
- Review Principal Project Company and D&C Contractor submittals pertaining to Commissioned Systems;
- Develop site observations reports during construction for Commissioned Systems;
- Develop construction checklists;
- Develop systems test procedures;
- Verify systems installation and operational performance;
- Maintain a Commissioning Issues and Resolution Log throughout the Commissioning process;
- Prepare and submit a Commissioning Report;
- Verify operator and occupant training delivery and effectiveness;
- Prepare, update, submit, and comply with the Systems Manual;
- Review SFMTA O&M Facilities operations 10 months after Substantial Completion;
- Development of an Ongoing Commissioning Plan; and
- Prepare a final Commissioning Report.

6.6.2. Pre-Construction Requirements

6.6.2.1. Commissioning Plan

The preparation and contents of the Commissioning Plan shall follow the requirements of ASHRAE Standard 202-2018.

Principal Project Company shall prepare and submit to the City for its review and approval no later than NTP2 a Commissioning Plan to evaluate and document that the design, construction, and operation of the Commissioned Systems comply with the Contract Documents. The purpose and intent of the Commissiong Plan is to ensure:

(a) the planning, design, construction, and operational processes have achieved their intended outcome;

(b) the continued efficient operation of the Infrastructure Facility during the IFM Period;

(c) all participants follow an approved plan to ensure the completed Infrastructure Facility will realize its intended level of comfort for Project users;

(d) all stakeholders in the Infrastructure Facility understand their responsibilities for Commissioning activities;

(e) all Project users will be familiar with the Infrastructure Facility and will understand their continuous role in its efficient operation; and

(g) the intended LEED NC Gold Certification for the Infrastructure Facility can be achieved and that LEED EBOM Gold Certification can be maintained through the IFM Period.

The Commissioning Plan shall include, at a minimum, the following information:

- Overview of the Commissioning activities developed specifically for the Project;
- Roles and responsibilities for the Commissioning Team throughout the Project;
- Documentation of general communication channels, including the distribution of the Commissioning Plan during the design and construction process;
- Detailed description of Commissioning activities that will occur between NTP2, Substantial Completion, and Final Acceptance;
- A schedule of activities and site visits, including any key meetings between Principal Project Company, City, and CxP;
- Project design documentation evaluation procedures;
- List of documents and materials to be provided for review by the D&C Contractor related to the Commissioned Systems;
- Guidelines and format that will be used to develop the Commissioning documentation, including Systems Manuals and training plans;
- List and format for design review's, checklists and testing forms, Commissioning Issues and Resolution Log, and Commissioning progress reports that will communicate and track critical Commissioning activities information;
- List of Commissioned Systems and description of evaluation procedures;
- A description explaining how the activities in the Commissioning Plan will verify the Commissioned Systems performance against the Contract Documents and the Infrastructure Facility's readiness for operations; and
- The process and procedures for whenever Commissioning evaluation does not comply with the Contract Documents

6.6.2.2. Review of Design Documentation

The CxP is required to conduct a design review, similar in rigor to a peer review, of the BODR, specifications, and design drawings at the following proprietary design review stages (see Section 1.8.5 of Division 1 of the Technical Requirements):

i. At completion of 100% Design Development stage; and
ii. During the 90% Construction Documents stage.

This review shall assess the adherence of the design to the Contract Documents and any highlight any potential issues with meeting the intended performance of the Infrastructure Facility.

Evidence of these design reviews shall be documented, at a minimum, in the Commissioning Issues and Resolution Log.

In addition to the Commissioning Issues and Resolution Log, for each round of design review, the CxP shall prepare and submit to Principal Project Company a design review memorandum addressing:

- List of the documents reviewed;
- Laws, standards, and guidelines used to perform the review; and
- A summary of the review flagging and describing major issues discovered.

The CxP shall submit the design review memorandum and Commissioning Issues and Resolution Log to Principal Project Company, no more than two weeks after the Design Deliverables are submitted for City review. Principal Project Company shall review the comments and respond to each item with acceptance or a response to the comment. All the comments shall be settled by Principal Project Company, D&C Contractor, and CxP. A workshop(s) between the D&C Contractor, Principal Project Company and/or CxP may be held to discuss any comments requiring clarification or discussions or decision by Principal Project Company. The CxP can chair these workshop(s).

Any CxP reviews of design documentation prior to NTP 2 may take place before or during the preparation of the Commissioning Plan.

6.6.2.3. Commissioning Issues and Resolution Log

Throughout the Commissioning process the CxP shall develop and maintain a Commissioning Issues and Resolution Log where deviations from the Contract Documents, system and component performance are identified and their resolution documented. The log shall identify, for each discipline in the Commissioning scope, the number of open issues, issues closed, and issued still pending, and shall be updated until final correction is made, verified, and closed.

The Commissioning Issues and Resolution Log shall be tabulated with the following information provided for each comment:

- Comment number;
- Comment date;
- Author;
- Referenced document, system, assembly, or equipment;
- Description of the issue;
- Reason for the comment (e.g. code compliance, coordination, operational impact.);
- Criticality of the issue; and
- Status of the issue (open, pending, closed)

The Commissioning Issues and Resolution Log shall be accessible at all times to Principal Project Company and the City.

6.6.2.4. Training Requirements for Commissioned Systems

Principal Project Company shall establish training requirements in the Commissioning Plan for Principal Project Company personnel involved in the operation, maintenance, safety, and quality-related activities of Commissioned Systems. The Commissioning Plan shall include recommended training procedures, materials, and records to ensure that the skills and professional judgment of Principal Project Company personnel are developed appropriately for their intended roles before Substantial Completion.

The CxP shall review and comment on any planned training as it relates to Commissioned Systems.

6.6.3. Construction Requirements

6.6.3.1. General

The CxP shall be responsible for the following:

- Coordinate and conduct all Commissioning activities as described in the Commissioning Plan in a logical, sequential, and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all parties, frequently updated timelines and schedules, and with technical expertise;
- Coordinate the Commissioning work with the D&C Contractor and their subcontractors and the Construction Manager and ensure that the Commissioning activities are being scheduled into Project Schedule;
- Revise, update and augment the Commissioning Plan in accordance with the requirements and format of ASHRAE standards and guidelines, as necessary;
- Coordinate and conduct the Commissioning kick-off meeting with the Commissioning Team within 60 days of NTP2 and issue meeting minutes;
- Review all Requests for Information (RFI) and change orders applicable to the Commissioned Systems for impacts on Commissioning and the Contract Documents.

6.6.3.2. Submittals Review

During construction the CxP shall review the Submittals stated in the Commissioning Plan as well as any construction Submittals generated by the D&C Contractor related to Commissioned Systems to verify compliance with the Contract Documents. The CxP shall enter all Commissioning Submittal reviews in the Commissioning Issues and Resolution Log. At a frequency determined by the Commissioning Plan, the CxP shall prepare and submit to Principal Project Company a Submittal review memorandum addressing:

- List of the documents reviewed;
- Codes, standards and guidelines used to perform the review; and
- A summary of the review flagging and describing major issues discovered.

The CxP shall notify Principal Project Company of any reviewed submittals that the CxP deems not to meet the requirements of the Contract Documents.

6.6.3.3. Site Visits/Field Observations

Throughout the D&C Period the CxP shall perform site visits as necessary to observe component and system installations. At a minimum, the CxP shall perform one site visit every two months during building construction.

If the CxP finds any work to be incomplete, inaccessible, incorrect, or non-functional, the CxP shall make note of deficiencies and report the deficiencies in writing to Principal Project Company and Construction Manager for remediation before system start-up work proceeds.

After each visit the CxP shall record noted deficiencies in the Commissioning Issues and Resolution Log.

Before system start-up begins, the CxP shall coordinate and perform a final installation verification audit with Principal Project Company and the Commissioning Team. The audit shall include a check of:

- Piping specialties including cleaning, flushing, hydrostatic testing, balance, control, and isolation valves;
- Ductwork specialty items including turning devices; balance, fire, smoke, and control dampers; and access doors;
- Control sensor types and locations;
- Identification of piping, valves, starters, gauges, thermometers, etc.;
- Documentation of pre-start-up tests performed, including manufacturers' factory tests;
- Circuit breaker settings;
- Maintenance accessibility to equipment; and
- Review HVAC (Air and water) pressure, leakage test procedures and flushing and witness their execution sufficient to be confident that proper procedures are being followed.

The CxP shall include all testing documentation in the Commissioning Report.

6.6.3.4. Pre-Functional Checklists and Start-up

The CxP shall provide a documented means to verify that equipment has been installed, and start-up has been completed in conformance with the Contract Documents and manufacturer's installations instructions.

Develop an enhanced start-up and initial systems checkout plan for equipment selected to be commissioned. The start-up and checkout results shall be clearly documented according to the manufacturer's written instructions and the Contract Documents.

1. A pre-functional and start-up checklist shall be developed by the CxP for each piece of commissioned equipment and shall include all required checks (mechanical, testing, adjusting and balancing (TAB), electrical and plumbing). The checklist shall be customized for the Project and refer to specific Contract Documents and manufacturer installation requirement as well as applicable codes and regulations;
2. Each checklist shall include a detailed points list and detailed control systems operation and calibration checks to ensure the building automation system (BAS) is fully checked, calibrated, and tested.

The pre-functional checklists are made up of the following:

1. **Equipment data:** Used to capture information that a maintenance management system would typically require. For example: tag number, make, model, serial number and location.

2. **Nameplate data:** Used to validate that the proper piece of equipment has been installed. Check to ensure that the installed equipment matches the approved equipment, use static information captured from the equipment nameplate as specified, as approved and as installed.
3. **Installation data:** Used to verify that the equipment has been properly installed and is a quality control check on the installation. Each check on the checklist shall be referenced to the Contract documents (specification section, drawing and specific detail) or manufacturer installation instruction specific page number.
4. **Start-up data:** Used to confirm that the equipment has been started in accordance with the manufacturers and specified requirements. Develop an enhanced start-up and initial systems checkout plan with contractors for equipment selected in the contract documents. The start-up and checkout results shall be clearly documented according to the manufacturer's written instructions and the Contract Documents.

The CxP shall verify/sample up to 10 percent of the D&C Contractor completed checks using randomly selected completed pre-functional checklists and report the results back to Principal Project Company. If the 10 percent sample fails, the D&C Contractor shall make the necessary corrections to all checklists and resubmit. The CxP shall then verify 20 percent of the resubmitted pre-functional checklists.

6.6.3.5. Testing, Adjusting and Balancing (TAB) Verification

The purpose of the HVAC TAB review is to verify the accuracy of the TAB work prior to commencing any functional performance test (FPT) activities that may be adversely affected by improper balancing. The CxP shall advise the D&C Contractor when systems are complete and ready for balancing, typically after the pre-functional checks are verified and accepted.

The CxP shall randomly sample the TAB report generated by the D&C Contractor and verify the system performance is accurately documented. This sample shall consist of 10 percent of documented measurements to verify and validate the reported results and reporting methods used. If significant issues are identified during the 10 percent verification, the D&C Contractor shall need to completely rebalance those systems as well as other similar systems and generate a revised TAB report, which shall be re-verified by the CxP.

To minimize any rework, the CxP may require that the D&C Contractor submit a customized TAB plan and procedures as required by the specifications prior to commencing TAB work. The CxP shall review the plan and meet with the D&C Contractor beforehand and discuss their approach to balancing the Project and provide guidance and assistance as needed. Results of review and meeting shall be documented.

Acceptance of TAB work by the CxP is a pre-requisite for starting Functional Performance Testing (FPT).

6.6.3.6. Functional Performance Testing (FPT)

During the acceptance phase of the Commissioning process, the CxP shall review the D&C Contractor's sequence of operations and clarify aspects and requirements that are ambiguous, incomplete, or not included. Where necessary the CxP shall rewrite the sequence in a format and language that help facilitate the writing of the program by the D&C Contractor. This sequence shall be used for testing. In the case where the FPT has been identified as failing the expected outcomes, the CxP shall allow for at least one re-test during the Commissioning process.

The CxP shall prepare FPT procedures for equipment and systems, using written, repeatable test procedures that are used to functionally test each system and assemblies. These tests shall be documented to clearly describe the individual systematic test procedures and the expected system response or acceptance criteria for each procedure.

Prior to testing, the CxP shall distribute the written procedures to be used during the test for review and pre-testing by the D&C Contractor.

The CxP shall also use the building management system control monitoring and historical data storage and trending capability to verify that the performance of the Commissioned Systems is achieved under varying load conditions throughout the building.

Functional performance testing (testing) shall address 100 percent of the Commissioned Systems. The CxP shall record all passes, failures, and deficiencies in the Commissioning Issues and Resolution Log. Failures and deficiencies shall be addressed by Principal Project Company and retested.

For HVAC systems specifically, the CxP shall:

- test the systems in automatic and normal mode (temperature, volume and pressurization control as well as of operations recovery after failure);
- test the systems in other significant modes, sequences, and control strategies including start-up, shutdown, unoccupied mode, manual mode, equipment component staging and backup upon failure (including air handling units, terminal boxes, fan coil units, fans, boilers, chiller, cooling towers, pumps, etc), modulation up and down of the unit's range of capacity, miscellaneous alarms, power failure, security alarm when impacted, and interlocks with other systems or equipment; and
- simulate high demand, off-season or unoccupied conditions through control system manipulation to verify proper system response and coordinated control, including alarms generation, operating and safety control functions.

For lighting systems specifically, the CxP shall verify and document configuration and calibration with all interior and exterior lights and lighting control equipment, which shall include but may not be limited to:

- occupancy sensors and daylight photocells, specifically, sensor location, sensitivity and time out settings suited for the application;
- verify and commission the system with the appropriate equipment, for example a light meter; and
- verify the lighting systems work in coordination with any building daylighting control systems.

The Principal Project Company shall be responsible for providing temporary network switches to enable IT / Comms system testing and any other testing. The City is not obligated to install its permanent network switches until after Substantial Completion but may do so earlier if the Project Schedule and Work progress allow and Principal Project Company agrees.

For clarity, the CxP shall not perform any of the testing required in this section and the CxP's actions shall not relieve Principal Project Company from any of Principal Project Company's obligations under the Agreement.

6.6.3.6.1. FPT Noticing and Results

Under the direction of the CxP, appropriately qualified personnel of Principal Project Company shall implement all testing as set forth in the Commissioning Plan. Principal Project Company shall give the City a minimum of 30 days' notice as to when the testing will begin and shall invite the City to witness and to comment on each aspect of the testing up until all testing is fully complete. Principal Project Company shall, together with such notice to the City, provide all information the City may reasonably require in relation thereto, including: (i) tests proposed; (ii) test methodology; and (iii) expected test results. The City shall be provided with full and reasonable access to all Commissioning activities to ensure the City remains fully informed of the process.

Within 15 Business Days following the last day of testing performed pursuant to this Section, Principal Project Company shall provide the City with testing results, certified as true, complete and correct by Principal Project Company.

6.6.3.7. Commissioning Report

After work described in Sections 6.5.3.1 through 6.5.3.6 above have been completed, the CxP shall tabulate and assemble all relevant findings and results into a Commissioning Report. Principal Project Company shall submit the Commissioning Report to the City for review and approval before Substantial Completion can be achieved.

The Commissioning Report shall include the following:

- A summary of Commissioning Plan including lists of participants and their role, building description, overview of the Commissioning scope, and a general overview of the testing and verification methods used;
- Description of Commissioning process benefits and results of the Commissioning process;
- A summary of the design review process;
- A summary of Submittal review process;
- A complete description of all FPT procedures, results and evaluation;
- An up-to-date and complete Commissioning Issues and Resolution Log with all entries resolved, plans for resolving any outstanding issues; all Commissioning activities to occur past Substantial Completion shall be clearly identified (if applicable);
- A clear, written confirmation that all failures or deficiencies in the Commissioning Issues and Resolution Log have been resolved;
- Clear, written confirmation that the individual systems and assemblies listed in Section 6.4 of this Division 6 meet the Contract Documents and that the Infrastructure Facility is ready for operations;
- Operations and maintenance materials (see Section 6.5.3.8 for requirements);
- Written evaluation of conducted training noting any further training needs or gaps; and
- Plan for resolution of any outstanding Commissioning-related issues

The Commissioning Report shall also include the following documentation as attachments:

- BODR;
- all design review and submittal review memoranda;
- Commissioning Plan;
- Meeting notes;
- Training records;
- Executed Pre-Functional Checklists;

- Start-up reports; and
- Trend logs.

6.6.3.8. Operation and Maintenance Materials

Principal Project Company shall ensure the IFM Provider and the City receive the following for information no later than Substantial Completion in accordance with ASHRAE Guideline 4, 2019 to enable efficient building operations and better ensure the results of Commissioning activities persist over time:

- A sequence of operations for the Infrastructure Facility;
- The Infrastructure Facility occupancy schedule;
- The equipment run-time schedules;
- The setpoints for all HVAC equipment;
- The lighting level settings throughout the building;
- The minimum outside air requirements;
- Any changes in schedules or setpoints for different seasons, days of the week, and times of day;
- A systems narrative describing the mechanical and electrical systems and equipment;
- A preventive maintenance plan for building equipment described in the systems narrative; and
- A Commissioning program that includes periodic Commissioning requirements, ongoing Commissioning tasks, and continuous tasks for critical facilities.

6.6.4. Post Substantial Completion Requirements

6.6.4.1. Systems Manual

The CxP shall prepare the Systems Manual for the Project in accordance ASHRAE Guideline 0–2019, Annex O. The Systems Manual shall include all the information necessary to operate, maintain, and re-commission all energy and water-consuming systems within the Infrastructure Facility. By its nature, the Systems Manual will be a collection of materials already produced by Principal Project Company, the D&C Contractor, or the CxP. Principal Project Company shall submit the Systems Manual to the City for review and acceptance no later than 180 days after Substantial Completion.

At a minimum the Systems Manual shall include the following:

- Executive summary;
- BODR;
- System single-line diagrams;
- Construction record documents and specifications;
- Approved submittals;
- As-built drawings;
- As-built sequence of operation;
- Original setpoints for all systems commissioned;
- Recommended schedule for recommissioning;
- Recommended schedule for sensor recalibration;
- Equipment operations and maintenance manuals;
- Equipment preventive maintenance schedules;
- Confirmation of completed training for IFM Provider and City personnel;

- Ongoing system optimization procedures; and
- Final Commissioning Report.

6.6.4.2. Post Occupancy Review of Building Operations

For purposes of complying with LEED Enhanced Commissioning and building envelope commissioning requirements, starting no later than 10 months after Substantial Completion, the CxP shall:

- review with Principal Project Company the current building operation and condition of outstanding issues and occupancy concerns related to the Contract Documents;
- interview the IFM Provider and SFMTA staff to identify problems or concerns they have with operating the Infrastructure Facility as originally intended and provide suggestions for improvements and record the changes in the Systems Manual;
- identify problems that are covered under warranty or under the original D&C Contract and make suggestions for improvements; and
- assist Principal Project Company and SFMTA staff in developing reports, documents.

The CxP shall provide written documentation to Principal Project Company on how to resolve outstanding Commissioning related issues within one (1) year after the Substantial Completion date to develop a final deficiency and action list. This documentation shall include requests for services to remedy outstanding problems. Principal Project Company shall provide the written documentation to the City for information.

Confirm execution of Monitoring-Based Commissioning (MBCx) plan, including:

- The review of metering and trend logs;
- The review the issues log showing results of the MBCx;
- Confirmation of the issues resolutions;
- Confirmation of ongoing operator training; and
- Update the Systems Manual with any modifications or new settings that differ from design, with explanations for the changes.

6.6.4.3. Near Warranty End Post Occupancy Review

Specifically for SFMTA O&M Facilities and certain Equipment List items, starting no later than 10 months after Substantial Completion, Principal Project Company shall:

- interview the SFMTA staff to identify problems or concerns they have with operating SFTMA O&M Facilities and certain Equipment List items as originally intended and provide suggestions for improvements and record the changes in the System Manual; and
- identify problems that are covered under warranty or under the original D&C Contract and implement improvements.

The PPC shall, one (1) year after the Substantial Completion date, provide written documentation to the City describing what was learned through interviews and investigations into performance of SFMTA O&M Facilities and certain Equipment List items, how issues will be resolved through warranties or other means, and develop a final deficiency and action list. This documentation shall include requests for services to remedy outstanding problems. Principal Project Company shall provide the written documentation to the City for information.

6.6.4.4. On-going Commissioning Plan

For purposes of complying with LEED Enhanced Commissioning and building envelope Commissioning requirements, the CxP shall produce and submit to Principal Project Company an Ongoing Commissioning Plan no later than one year after the Substantial Completion Date. The plan shall provide the Infrastructure Facility operating staff with procedures, blank test scripts, and a schedule for ongoing Commissioning activities.

The Ongoing Commissioning Plan shall include the following:

- The definition of the ongoing Commissioning process;
- Defined roles and responsibilities;
- Recommended schedule for recommissioning as-built systems;
- Continuous documentation and updating of Infrastructure Facility's operating plan to meet the requirements of the Contract Documents throughout the building's lifetime;
- Blank testing materials, including functional performance tests for all commissioned as-built systems in the building, as well as an issues log; and
- Direction for testing new and retrofitted equipment.

6.7 Monitoring-Based Commissioning (MBCx)

For purposes of complying with LEED Enhanced Commissioning and building envelope Commissioning requirements, Principal Project Company shall develop Monitoring-Based Commissioning (MBCx) procedures and identify points to be measured and evaluated to assess performance of energy- and water-consuming systems. MBCx requirements shall be included in the Commissioning Plan and shall address the following:

- Defining roles and responsibilities;
- Measurement requirements (meters, points, metering systems, data access);
- The points to be tracked, with frequency and duration for trend monitoring;
- The limits of acceptable values for tracked points and metered values (where appropriate, predictive algorithms may be used to compare ideal values with actual values);
- The elements used to evaluate performance, including conflict between systems, out-of-sequence operation of systems components, and energy and water usage profiles;
- An action plan for identifying and correcting operational errors and deficiencies;
- Training to prevent identified errors; and
- Planning for repairs needed to maintain performance.

In addition, the MBCx requirements in the Commissioning Plan shall:

- Define analysis procedures, including the frequency of MBCx-related analyses in the first year of occupancy (at least quarterly);
- Outline the evaluation process and determine the procedure for handling system conflicts, usage profiles, and out-of-sequence operations;
- Include preventive planning and maintenance procedures necessary to meet performance goals; and
- Determine measurement requirements and decide whether predictive algorithms can be used in conjunction with metered points.

Principal Project Company shall work with the CxP to ensure that requirements for MBCx are included in all Commissioning-related documents, including:

- specific trends to track in the BODR;
- Metering and monitoring required for MBCx;
- Single-line or riser diagrams for location of building and system meters in the design submittals;
- Controls sequences for specification of appropriate monitoring points in the design submittals;
- Submittal reviews of meters, energy analysis software, and drawings of controls for compliance with Principal Project Company's MBCx metering and monitoring requirements;
- Creation and completion of pre-functional tests for MBCx-related equipment, such as meters and energy analysis software programs; and
- IFM Provider educational materials regarding measurement techniques, energy analysis software tools, and fault detection and fault resolution, are incorporated into training documentation for the IFM Provider.

After MBCx activities are complete, the CxP shall update the Systems Manual with any modifications or new settings and give the reason for any modifications from the original design. Principal Project Company shall submit any revised Systems Manual to the City and the IFM Provider.

6.8 Operational Readiness (OR)

Principal Project Company acknowledges that the City will be preparing for day one performance of the SFMTA O&M Services (see Section A.2.1.2 of Division 7). The City requires Principal Project Company support to ensure SFMTA staff are ready to perform the SFMTA O&M scope of work.

Principal Project Company shall develop and implement a process with the City for transitioning from construction to full operation and achieving day one operational success operating the equipment and facilities related to SFMTA O&M Services. This process may be termed in a variety of ways, including but not limited to ensuring 'operational readiness.'

Principal Project Company, in consultation with and with contributions from the City and selected stakeholders, shall develop an integrated Operational Readiness Plan that details:

- Stakeholder engagement plan;
- Operational readiness governance structure and points of contact;
- Schedule for all familiarization, maintenance, and operational training consistent and coordinated with other training requirements in the Technical Requirements;
- Proving trial program for all; and
- Handover and post-transition support plan that includes success factors for day one operations

[The City shall provide Principal Project Company with SFMTA Bus Yard Standard Operating Procedures (SOPs) that describe the intended City operations and process flows in the Infrastructure Facility. Principal Project Company shall review the SOPs and shall check for alignment or conflict with Principal Project Company's operations and design documents.] The City will identify and provide contact information for SFMTA's operational readiness and transition team members.

Principal Project Company shall prepare the Operational Readiness Plan and submit it to the City for review and approval no later than 180 days prior to the scheduled Substantial Completion Date. Principal Project Company shall amend and reissue the plan if changes are required. All activities in the Operational Readiness Plan shall be either: (1) completed no later than the Substantial Completion Date; or (2) completed after the Substantial Completion Date as part of the Bedding-In Period activities.

Principal Project Company shall allow for appropriate engagement with designated City staff in the implementation of the Operational Readiness Plan. This shall be accomplished through an Operational Readiness Working Group (ORWG) comprised of Principal Project Company and City staff, and other stakeholders as appropriate. The ORWG shall communicate closely with the [Transition Committee] (see Section [B-25] of Division 7 of the Technical Requirements) and ensure the Operational Readiness Plan is coordinated with the Bedding-In Period and move-in activities and schedule.

Principal Project Company shall provide a dedicated Operational Readiness Point of Contact (OR POC) during the operational readiness period. This Point of Contact shall participate in operational readiness governance and the ORWG, and shall be responsible for coordinating and implementing the Operational Readiness Plan with the ORWG. Specifically, the Point of Contact shall be responsible for coordinating the provision of resources to support Operational Readiness activity, any rectification needs, and act as liaison between the ORWG and the other stakeholders onsite such as the D&C Contractor and the CxP.

The ORWG shall be formed no later than 270 days prior to scheduled Substantial Completion Date and shall initially meet on a monthly cadence to contribute to, review, comment on, and complete the Operational Readiness Plan. However, to be specified in the Operational Readiness Plan, it is anticipated that meeting frequencies will increase as the transition date nears. It is anticipated that during the trial period meetings will be weekly with go-no-go calls the day prior to every trial. In the countdown period immediately prior to transition the ORWG will likely need to meet daily.

Operational Readiness stakeholders, including the ORWG, will require access to the Project Site prior to Substantial Completion to plan for operations, transition and perform early trials. Principal Project Company shall facilitate the City's and other stakeholder’s safe and secure site access and to manage this process, noting the control of the site.

Principal Project Company shall provide input on the Operational Readiness assessment and ensure that building systems and equipment necessary to support scheduled trials will be ready. Principal Project Company shall make allowance for safe access to such areas within the site as necessary to facilitate the City’s transition team and SFMTA operational staff as necessary to allow a successful transition to the facilities becoming operational.

Principal Project Company shall fully engage with the City’s transitioning team and shall allow for provision of a full and effective handover. This will include timely provision of the Systems Manual and any other necessary documentation to allow the transition to take place.

Principal Project Company shall support the City with post-opening support as required and requested by the City. This may include systems hand-holding support, snagging, and lessons-learnt sessions.

Division 7: Infrastructure Facility Management (IFM) Specifications

POTRERO YARD MODERNIZATION PROJECT

Exhibit 18:

Technical Requirements

Division 07:
Infrastructure Facility Management Specifications

November 15, 2024

FINAL DRAFT

TABLE OF CONTENTS

Definitions

[Note: All terms have been moved to Exhibit 1 (Abbreviations and Definitions) of the DBFOMA.]

Section A - Introduction

A.1 Guiding Principles

(1) The IFM Services detailed within these IFM Specifications form various aspects of what is expected to be a fully integrated and coordinated service. PPC will integrate and coordinate each IFM Service with all other services to provide an integrated and complete service solution.

(2) While the IFM Services are described by their traditional functional titles, City encourages innovative approaches and task configurations to support maximum effectiveness in service delivery in supporting the continuous operation of the Infrastructure Facility in its delivery of services such that there is a minimized impact on the delivery of the IFM Services or risk to Building Occupants and the surrounding community.

(3) This document describes the IFM Services that PPC is required to provide throughout the IFM Period.

(4) These obligations are organized into IFM Services categories.

(5) These IFM Specifications do not necessarily list all of the activities and steps that PPC must perform in order to fulfil the requirements for the Infrastructure Facility. PPC shall tailor its solutions and services to these requirements.

A.2 City/ PPC Division of Responsibilities

Pursuant to Division 1 (General Provisions) of Exhibit 18 Technical Requirements, this document outlines the responsibilities as between PPC and the City related to the Infrastructure Facility consisting of the Bus Yard and Common Infrastructure.
This section is a brief overview of responsibilities and is meant to be read in conjunction with the rest of the document and other related documents outlining scope and responsibility. It is not meant to be all inclusive.

A.2.1.1. IFM Services

IFM Services Item	Description
Building Systems	
Structural system	PPC is responsible for the complete structural system of the BYC and the Common Infrastructure (i.e., the Infrastructure Facility). This encompasses the portions of the vertical and lateral structural system of the BYC needed to support the HCC. This includes: (a) the BYC's roof structure supporting the HCC over it; (b) the vertical structure and complete foundations system; and (c) the BYC's complete lateral force resisting system including foundations, collectors, etc.

IFM Services Item	Description
Building Envelope	PPC is responsible for the complete exterior envelope of the entire Infrastructure Facility, including cladding, waterproofing, and insulation. The building envelope includes the waterproofing system of the roof structure supporting the HCC over the podium.
Demising walls separating the BYC from the HCC	If PPC's approach for the Project provides demising walls that are designed and constructed as a single wall assembly, then demising walls will be considered to be part of the Common Infrastructure for which PPC has responsibility. If PPC's approach for the Project provides demising walls that are designed and constructed as two separate and independent wall assemblies – one facing the BYC and the other facing the HCC –, then each will be considered to be part of the corresponding Project component and PPC shall have responsibility for the wall assembly directly facing the BYC.
Signage and Wayfinding	PPC is responsible for all signage and wayfinding components for spaces allocated to the Common Infrastructure
Building mechanical, electrical, and plumbing systems and common utility systems	PPC is responsible for the complete HVAC, plumbing, electrical, lighting, fire and life safety systems, MEP system controls, and Building Automation System serving the Infrastructure Facility. The MEP systems include hot and chilled water physical plants, electrical distribution systems, and backup power systems. The Compressor Equipment System shall also be PPC's responsibility. If PPC's approach for the Project includes common Utility systems for the Facility as a whole, as described in Division 4 (Supplementary Design Criteria) of Exhibit 18 (Technical Requirements), then the common utility systems will be part of the Common Infrastructure for which PPC is responsible. In this case, they will include the Facility-wide Building Management System.
Fire and life-safety systems	PPC is responsible for fire and life-safety within the Infrastructure Facility. If PPC's approach for the Project includes an integrated Facility-wide fire and life-safety system, then the fire and life-safety system will be considered part of the Common Infrastructure for which PPC is responsible. In this case it will include the Facility-wide fire and life-safety control systems. This includes annunciation (speakers) and fire protection devices (alarms, detectors, sprinklers heads and extinguishers)
Information Technology, Communications, and Security Systems	For IT, communication, and security systems, PPC's responsibilities will be according to the scope of work allocation defined in Table 5 and Table 6 of Appendix A of Division 1 (General Provisions) of Exhibit 18 Technical Requirements.
Civil and Utility Systems	For civil and Utility systems, the IFM Services will be for the full Infrastructure Facility according to the scope of work allocation defined in Section 2.1 (Common Infrastructure) of Exhibit 18 (Technical Requirements).
Building Spaces	
Building system spaces	PPC is responsible for rooms for civil and Infrastructure Facility Utility systems, MEP systems, and/or common Utility systems that are allocated to the Common Infrastructure as described above and as described in Section 2.1 (Common Infrastructure) of Exhibit 18 (Technical Requirements).

IFM Services Item	Description
Vertical circulation	PPC is responsible for all stairs, emergency egress, escalators, and elevators in the Infrastructure Facility that have shared uses for each PPC component as described in Section 2.1 (Common Infrastructure) of Exhibit 18 Technical Requirements. This includes all the shared mechanical and electrical systems for vertical conveyance.
Common-use spaces	PPC is responsible for all common use enclosed or open spaces (whether public or private, including the podium roof open space), shared entrance lobbies, shared restrooms (whether public or private), and shared service areas (e.g., loading docks, storage spaces, waste handling facilities) as described in Section 2.1 (Common Infrastructure) the Exhibit 18 (Technical Requirements).
Public right-of-way improvements	
Public Right-Of-Way Improvements	PPC is responsible for all specialty paving and public sidewalks, but excluding bike racks, and exterior signage included in the Project to meet the Technical Requirements.

A.2.1.2. SFMTA O&M Services

SFMTA O&M Services	SFMTA O&M Facilities
Transit vehicles	City is responsible for O&M and lifecycle of City buses and Non-Revenue Vehicles.
Maintenance and Transit Spaces and FF&E	City is responsible for O&M and lifecycle of the maintenance bays, shops, and transit vehicle maintenance equipment; specifically, any space or equipment used solely in connection with the SFMTA O&M Services. This includes all Maintenance and Transit Spaces and includes management of replacement parts inventory. Includes O&M of the FF&E installed and used in these spaces, excluding the Compressor Equipment and System that will be the responsibility of PPC.
Transit vehicle traction power systems	City is responsible for O&M and lifecycle of the trolley bus OCS
Transit communication, security, and IT systems	City is responsible for IT, communication, and security systems, the SFMTA O&M Services will be according to the scope of work allocation defined in Table 5 and Table 6 of Appendix A of Division 1 (General Provisions) of Exhibit 18 Technical Requirements.
Office / Admin and Training Spaces and FF&E	City is responsible for O&M and lifecycle of Office / Admin and Training Spaces including Office / Admin and Training Spaces FF&E.
Ancillary facility services	City is responsible for O&M and lifecycle activities related to the BYC such as custodial, building security, uniforms, catering, and other such services that the City customarily performs in its existing transit maintenance and storage facilities.

A.2.1.3. City Responsibility

For clarity, within the Maintenance and Transit Spaces and the Office / Admin and Training Spaces, the following are the responsibility of the City where the City is responsible for O&M and lifecycle in accordance with Section A.A.2.1.2:

- All City equipment used for bus operations or bus maintenance.
- AV equipment and related cabling, mounting hardware, etc.
- All Ethernet and Wi-Fi equipment, cabling, etc.
- Appliances (refrigerators, microwaves, dishwashers, coffee machines.)
- Wall finishes (panels, drywall, paint, moldings).
- Ceiling (suspended from the floor slap. Any kind, whether finished drywall or suspended, including HVAC grills).
- Flooring (any finishes on top of the concrete floor slab, including epoxy finish).
- Doors (including hinges, locks, door closers, door stops, handles, etc. on both sides of the door).
- Light fixtures, ballasts, bulbs, including emergency lights.
- Outlets and switches in the walls, including ethernet, cable, electrical, AV)
- Plumbing fixtures, including shut off's and piping from shutoff to fixtures.
- Ventilation grills.
- Millwork (cabinets and counter tops, lockers, built-in furniture)

A.2.1.4. PPC Responsibility

The PPC is responsible for O&M and lifecycle of spaces which is not City's under Section A.2.1.3 and as otherwise defined in Appendix D ("PPC Spaces") in accordance with Section A.2.1.1.

Section B - General Requirements

B.1 Overview

(1) Read in conjunction with the entirety of the Agreement, these IFM Specifications set out the requirements for the IFM services to be provided by PPC during the IFM Period.

(2) These IFM Specifications include all Maintenance Services required to ensure the Maintained Elements meet the Performance Requirements and to ensure that the Infrastructure Facility remains operational throughout the IFM Period.

(3) PPC shall provide all services that are required to ensure the integrity of the Infrastructure Facility during the IFM Period.

(4) The IFM Services detailed within these IFM Specifications form various aspects of what is expected to be a fully integrated and coordinated service. PPC will integrate and coordinate each Service Category with all other Service Categories to provide an integrated and complete facilities management solution.

(5) PPC shall deliver IFM Services to the required standards, including the following:

(a) Provide all IFM Services 24 hours per day, 365(6) days per year as required.

(b) Fully integrated, coordinated, and organized IFM Services to provide an integrated, comprehensive facilities management solution for City.

(c) Services, materials, repairs, replacements, and renewals at a minimum to meet the standards outlined in this section and the Technical Requirements.

(d) Maintain a safe, compliant, functional working environment at the Infrastructure Facility.

(e) Provide all parts, materials, supplies, systems, and other components in new condition unless prior written consent is received from City.

(f) Provide integrated, high quality, efficient, innovative, and flexible IFM Services at all times to achieve the Technical Requirements.

(g) Maximize efficiency of and minimize disruption to SFMTA O&M Services.

(h) Provide a full audit trail of activities involved in delivery of the IFM services.

(i) Implement improved techniques, procedures, materials, supply, and service delivery methods in keeping with leading practices in facilities management over the Term.

(j) Cooperate with City in their planning and management of special events or visits by guests of City.

(6) Where the term “free from” is used, the service requirement will be to ensure that the equipment, component, or finish is maintained in accordance with Good Industry Practices for similar facilities.

B.2 Comprehensive Service

(1) PPC shall provide, purchase, deliver and install or implement, unless otherwise expressly provided, all requisite resources, services, supplies, consumables, parts, plant, equipment, apparatus, tools, or other materials required for the proper execution of all IFM Services and/or related services.

(2) PPC acknowledges that there may be services or tasks to be performed that are not described in the Agreement, but are related or necessarily ancillary to the delivery of the IFM Services and these shall be performed by PPC as part of the IFM Services in accordance with the intent of this Section and as otherwise required by Good Industry Practice. PPC shall perform or provide those services as if they were included in this Section. This will not constitute additional scope of services.

B.3 Legislative Requirements

(1) PPC shall:

(a) Advise City of any orders, warnings or non compliance citations issued by any relevant Authority(ies) Having Jurisdiction that PPC becomes aware of, along with plans to rectify or address any related requirements imposed by the relevant authorities.

(b) Provide an annual report on permits, licenses and approvals associated with work conducted by PPC.

(c) Ensure the status on all statutory testing is reported to City on a monthly basis or otherwise as required by Applicable Law and Standards.

B.4 City Standards and Policies

(1) PPC shall adhere to City standards or policies, including Standards and Specifications, existing as at the Setting Date.

(2) Changes in Standards and Specifications are subject to Section 7.2.4 of the Agreement.

B.5 Annual Service Plan

B.5.1. Annual Service Plan

(1) PPC shall develop the Annual Service Plan in accordance with the items listed below at a minimum. PPC may include additional information as appropriate.

(a) A brief narrative overview or executive summary of PPC's approach to delivery of the IFM Services.

(b) The plan for delivery and provision of each of the IFM Services, including upcoming procurement activities, changes, audits, etc. along with potential impacts to City.

(c) A detailed organizational and staffing plan for the upcoming Contract Year.

(d) Activities or initiatives that may cause disruption to Building Occupants and the methods and/or accommodations PPC will implement to minimize such disruptions.

(e) An analysis of past performance and upcoming changes to improve delivery of the IFM Services.

(f) Recommendations for changes to any joint service protocols and procedures between PPC and City.

(g) Any proposals for changes to IFM Services or the procedures that may impact SFMTA O&M Services.

(2) The Annual Services Plan shall be reviewed and revised by PPC annually and re-submitted to City.

B.6 IFM Services Procedures

(1) IFM Services Procedures are intended to guide the on-going service delivery by PPC and their Contractors at the Infrastructure Facility.

(2) PPC shall develop IFM Services Procedures for the service areas as outlined below, at a minimum, to provide IFM Services in accordance with the relevant sections of these IFM Specifications. These may be incorporated in PPC's overall procedure documentation and may be standard procedures, however all unique City requirements are to be addressed.

(3) The IFM Services Procedures shall, at a minimum, include the following:

(a) General Management

i. Communications & Committee Procedures

ii. Human Resources

iii. Occupational Health and Safety/Risk Management.

iv. Quality Management Plan.

v. Periodic Reporting (process and templates)

vi. Performance Monitoring Program

vii. Help Desk Services.

viii. Utilities Management Services

ix. Environmental Management System, relative to Environmental and Sustainability Services.

x. Emergency Management, including operational risk assessment

xi. Fire Management Plan.

(b) IFM Project Site & Infrastructure Facility Operations

i. Security Services

ii. Solid Waste Collection, Recycling, and Removal Services.

iii. Pest Control Services

iv. Grounds Maintenance Services.

v. Cleaning Services

vi. Maintenance Services

vii. Renewal Work Services.

B.6.1. IFM Services Procedures Submission Process

(1) For all IFM Services Procedures required under these IFM Specifications, PPC shall:

(a) Submit a schedule of Submittals required under these IFM Specifications at least ten (10) months prior to Substantial Completion Deadline, to commence no later than eight (8) months prior to Substantial Completion Deadline and the final submitted no later than one (1) month prior to Substantial Completion Deadline.

(b) Include in the schedule timelines for 2 drafts and 1 final version or each Submittal required under these IFM Specifications and be staggered, taking into account City resource requirements. Meetings to review the Submittals shall be included in the schedule.

(c) Identify in advance, requirements needed from City for information, additional meetings, and access to City subject matter experts, City procedures and other information needed by PPC to develop the IFM Services Procedures.

(2) City will review the Submittals in accordance with Exhibit 11 (Submittals Review Process) of the Agreement and will provide comments to PPC for changes by PPC in the subsequent Submittals where they do not meet Good Industry Practice for facilities procedures, do not adequately demonstrate that the IFM Services Procedures will result in the IFM Services being delivered in accordance with these Contracts or otherwise as set out in the Submittal Review Process.

(3) Regardless of City's comments and resulting changes, PPC retains full responsibility to ensure that its obligations are carried out in accordance with the Agreement.

(4) The IFM Services Procedures shall be reviewed by PPC annually following the Substantial Completion Deadline and if changes are required, revised IFM Services Procedures are to be re-submitted to City for review.

B.7 Special Occasions, Visits and Events

(1) City will provide PPC with a list of planned special occasions and events planned which may impact the activities at the Facility and consequently, PPC activities that are required.

(2) PPC shall lower and raise the flags at the times and on the days required based on instruction from City. These requirements will be based on local, state and federal protocols.

(3) PPC shall make provision for and cooperate with City to prepare for visits by guests of City.

B.8 Human Resources

B.8.1.1. Delivery organization

(1) Without limiting Article 9 of the Agreement, PPC Shall:

(a) Provide and have in place a delivery organization with sufficient qualified, trained and competent resources and related support to deliver the IFM Services.

(b) Introduce all resources to City and clearly identify roles and responsibilities, as well as reporting hierarchy.

(c) Have in place a policy and process for addressing employees or Contractor employees who do not follow City policy when on-Infrastructure Facility, including progressive discipline and possible release or re-assignment, including at the request of City acting reasonably.

(d) Have in place policies and procedures to deal with all human resources issues and in particular to be compliant with relevant City policies and procedures.

B.8.1.2. PPC Representative

(1) PPC shall provide an IFM Manager to represent PPC and manage IFM Services at the Infrastructure Facility. This representative (or qualified delegate) shall be available 24 hours per day/365(6) days per year and directly contactable by the City Authorized Representative.

(2) The IFM Manager shall be in place at least 6 months prior to Substantial Completion Deadline and be involved in Move- In processes.

B.8.1.3. Infrastructure Facility Security Screening

(1) PPC shall ensure that all new staff do not commence work at the IFM Project Site until the results of a recent criminal record check and background screening have been provided and proved satisfactory to City.

(2) PPC shall ensure any PPC employees or Contractor employees for whom these screenings are outstanding and who is required to perform IFM Services at the IFM Project Site shall be escorted and continually supervised by a PPC employee who has passed the criminal record check and whose background screening has been proved satisfactory to City.

(3) City has the right, acting reasonably, to refuse access to the IFM Project Site to any individual failing to meet the City security clearance requirements, at any time during the IFM Period.

B.8.1.4. Work Wear and Attire

(1) PPC shall ensure that all PPC employees and Contractor employees shall be properly and presentably dressed and where required in appropriate uniforms and work wear including necessary personal protective equipment (PPE).

(2) PPC employee or Contractor employees shall:

(a) Not wear articles of clothing or other accoutrements that express personal opinions or which others may find offensive or as harassment.

(b) Wear identification badges, in accordance with City security policies, which will at a minimum include the PPC authorized individual’s photo, name and company name, at all times. The identification badges will be provided by PPC at their cost.

(c) Abide by City dress code and other policies as applicable.

B.8.1.5. Training and Qualifications

(1) In addition to orientation and OH&S training, PPC shall:

(a) Provide all employees with and ensure all Contractor employees are provided with training on their specific job responsibilities, duties, and tasks.

(b) Ensure that all employees and Contractors have up-to-date certification, training and qualifications related to their responsibilities.

(c) Ensure that all personnel providing IFM Services at the Infrastructure Facility hold the required professional designations or certifications to perform the work in accordance with the relevant Governmental Entity(ies).

(d) Maintain training records and certification records for each individual and provide to City as requested for review but in no case less than annually.

B.8.1.6. Infrastructure Facility Orientation

(1) All PPC employees and Contractor employees providing IFM Services at the Infrastructure Facility shall be provided with an orientation course prior to commencing work at the Infrastructure Facility. PPC shall provide orientation material to City for review and also provide an updated list of PPC employees and Contractor employees with confirmation of their orientation date. Orientation will include:

(a) PPC specific company orientation related to their position and responsibilities shall including at a minimum:

i. Job role descriptions, tasks and responsibilities.

ii. Reporting relationships for each job.

iii. Geography of the IFM Project Site and Infrastructure Facility.

iv. Interaction with lines of communication between PPC and City.

v. Knowledge of Applicable Law and Standards.

vi. Knowledge of PPC policies on health and safety, and all other policies.

vii. IFM Project Site and equipment safety.

viii. Customer satisfaction and customer interaction.

ix. Personal hygiene.

x. Appropriate dress and rules of conduct while on the IFM Project Site or in the Infrastructure Facility.

xi. Fire risks and fire precautions.

xii. Respectful workplace / workplace harassment policies.

xiii. Familiarization with SFMTA O&M Services.

xiv. CAFM user instructions, building automation and Help Desk

xv. Confidentiality agreement.

xvi. Communication Protocols.

(b) PPC orientation shall also include City-specific orientation related to working in and around SFMTA O&M Services, as provided by City for delivery by PPC or to be provided by City at their option.

B.8.1.7. Occupational Health & Safety

(1) PPC shall have a comprehensive health and safety procedure and ensure it is available to, and used by, all PPC employees.

(2) PPC shall provide training to all employees and ensure Contractor employees receive training including:

(a) Fall arrest training, where applicable.

(b) WHMIS training.

(c) Safe lifting.

(d) Emergency and pandemic preparedness plans.

(e) Infrastructure Facility evacuation training.

(f) Workplace violence prevention.

(g) Personal protective equipment.

(h) Respiratory protection program.

(i) Health & Safety policy statement.

(j) Hazard/Incident reporting.

(k) Incident/Accident investigation.

(l) Obtaining first aid.

(3) PPC shall participate as a guest in City's Occupational Health and Safety committee meetings as requested to address Infrastructure Facility-based occupational health and safety issues and address concerns raised by City.

(4) PPC shall report all recordable injuries and near miss incidents to City in a prescribed format and at a frequency agreed upon with City, at a minimum at the scheduled monthly meetings with City.

B.9 Management Interfaces & Communications

B.9.1.1. Communications Protocol

(1) PPC shall work with City to:

(a) Establish the responsibilities and lines of communication between City and PPC.

(b) Coordinate all communications between PPC, PPC's Contractors, City, Other Contractors and other nominated parties as required by the City.

(c) Provide City with information required by City for communication to internal or external parties such as relevant authorities, the media and the public. PPC shall provide the information in a timely manner but not more than 48 hours after the request.

(d) Notify City immediately using the agreed communication protocol when PPC becomes aware of issues or failures that may impact SFMTA O&M Services.

(e) Refer all external requests for information related to the Infrastructure Facility to City.

B.9.1.2. IFM Operations Committee

(1) Not later than 8 months prior to the Substantial Completion Deadline PPC shall establish a monthly IFM Operations Committee to deal with operational interface and communications at the Infrastructure Facility, both prior to and during the IFM Period including:

(a) The transition from the Existing Facilities to the Facility.

(b) Any joint review of the IFM Services and the Technical Requirements.

(c) Any changes to the IFM Project Plans.

(d) Any performance issues.

(e) Any interface issues between the IFM Services and SFMTA O&M Services.

(f) Any special matter referred to the IFM Operations Committee by City or PPC.

(g) Any community and media relations issues.

(h) Any other issues pertaining to the IFM Services.

(2) The IFM Operations Committee does not relieve PPC from communicating on a regular and timely basis directly with City as required.

(3) PPC shall communicate to the IFM Operations Committee at a minimum regarding the following:

(a) Upcoming Maintenance Services.

(b) Renewal Work.

(c) Changes or anticipated changes in personnel, progress of recruitment.

(d) Status of PPC Resources training.

(e) Analytics and statistics for the purposes of proactively identifying issues and opportunities.

(f) Status on the implementation of tasks identified by the IFM Operations Committee.

(g) Status on other tasks and/or action plans.

(h) Other operational plans or activities.

(i) Status of Change Orders.

(j) Reports that are required to be delivered to City.

(k) Status of rectification activities as a result of an order by authorities having jurisdiction.

(4) City shall communicate to PPC information related to City specific activities that may impact PPC's day-to-day performance of the IFM Services.

(5) PPC shall present reports to the City including Performance Monitoring Reports, summarize activity, present any future plans and upcoming changes that may impact the day-to-day operations of the Infrastructure Facility and discuss performance management results, staff complaints and any related corrective plans.

(6) PPC Responsibilities for the IFM Operations Committee shall include:

(a) Develop and maintain procedures and schedules for the conduct of the activities of the IFM Operations Committee in mutual agreement with City, as appropriate from time to time;

(b) Prepare the agenda and provide at least five Business Days in advance of the meeting; and

(c) Prepare minutes and provide them to City not more than five Business Days following the meeting. Minutes shall include issues, discussion summary and action items which will be tracked and reported at each meeting. Unless City notifies Principal Project Company within five Business Days of receipt of the minutes that City disagrees with the contents of the minutes, City and Principal Project Company shall be deemed to have approved such minutes. Principal Project Company shall maintain a complete set of all minutes of the meetings of the IFM Operations Committee and shall make such minutes available for inspection by City during regular business hours.

(7) The IFM Operations Committee shall not have authority to make decisions with respect to or approve:

(a) Any amendment to or waiver of any provision of the Agreement;

(b) Any change that may materially adversely affect PPC's ability to perform IFM Services or SFMTA's ability to perform SFMTA O&M Services; or

(c) Any matter with respect to which City has a right of consent pursuant to the Agreement.

(8) The Committee shall be composed of:

(a) Two PPC Representatives

(b) One City FM Representative

(c) One City Maintenance Representative

(d) One City Authorized Representative

(9) City shall select the chairperson of the IFM Operations Committee.

(10) City shall be entitled to replace any of their respective representatives on the IFM Operations Committee by written Notice to Principal Project Company. City will use commercially reasonable efforts to deliver prior written Notice of any such replacement to Principal Project Company. Principal Project Company may replace its representative on the IFM Operations Committee with the prior written consent of City, not to be unreasonably withheld or delayed.

(11) The Committee shall meet:

(a) Monthly unless otherwise mutually agreed by the members of the IFM Operations Committee or the Parties.

(b) Ad hoc as required by PPC or City to address specific issues or topics. Special meetings of the IFM Operations Committee may be convened on not less than 5 Business Days' Notice to all members of the IFM Operations Committee identifying the agenda items to be discussed at the special meeting, provided that, in an Emergency, a meeting may be called at any time on such Notice as may be reasonable in the circumstances.

(12) Unless otherwise agreed by the members of the IFM Operations Committee, the IFM Operations Committee shall meet at the IFM Project Site or another location in San Francisco, California. Meetings of the IFM Operations Committee may be held by means of such telephonic, electronic or other communication facilities as permit all persons participating in the meeting to communicate with each other simultaneously and instantaneously. A person participating in a meeting by such means will be deemed to be present at such meeting, provided that each member of the IFM Operations Committee must attend in person at least once each calendar quarter.

(13) Members of the IFM Operations Committee may invite, on prior Notice to all members, such advisors and consultants as they require from time to time to attend meetings and provide briefings to the IFM Operations Committee.

(14) One representative of City and one representative of Principal Project Company shall constitute a quorum at any meeting of the IFM Operations Committee. A quorum of members may exercise all the powers of the IFM Operations Committee. The members shall not transact business at a meeting of the IFM Operations Committee unless a quorum is present.

B.9.1.3. Operational Issues Resolution

(1) PPC shall develop and implement an operational issues resolution process that is acceptable to City and consistent with the Agreement. The process shall define resolution timelines and enable escalation of issues to more senior levels, including, as necessary, following Article 18 (Contract Dispute Procedures).

B.9.1.4. City Orientation & Training

(1) PPC shall develop and implement, in collaboration with City, a service orientation program for relevant City Personnel which they will conduct initially prior to the Substantial Completion Deadline and then when City changes City Personnel, or from time to time acting in accordance with Good Industry Practice, at the Infrastructure Facility. The service orientation program shall be in accordance with City requirements.

(2) PPC shall develop and distribute, at City's discretion, a summary of the IFM Services.

(3) PPC shall ensure that City Representative has updated, correct and timely information about the CAFM, security system and any other PPC provided system which City operates or interfaces with.

(4) PPC shall provide training to the required City Personnel initially as directed by the City Representative on equipment and systems for related to the SFMTA O&M Services.

(5) The Help Desk Services shall also include formal communications (electronic information or paper flyer, at City discretion) and ad-hoc training as may be required to ensure City staff are aware of the Help Desk Services.

(6) PPC shall develop and implement, in collaboration with City, an electronic training program for City staff that operate, use, or interface with any of the Maintained Elements. City shall implement a "train the trainer" program; however, PPC shall be required to conduct training program or refresher every 2 years for the trainer and any other staff required by City. In addition, if the equipment, procedures or software related to the Maintained Elements changes, PPC shall provide revised training related to the changes.

B.10 Periodic Reporting

(1) PPC shall provide periodic reporting as outlined further below. Periodic reporting shall include all reporting requirements outlined in this IFM Specification.

(2) All reports shall be made available in print and searchable electronic format. Data related to reporting shall be made available for download or export in original electronic format that permits analysis and drill-down as applicable.

(3) The Monthly Reporting further below outlines specific requirements but does not relieve PPC from periodic reporting responsibilities outlines elsewhere in these IFM Specifications or in the Technical Requirements as it relates to the IFM Services. Reports are expected to provide City with sufficient information to verify PPC's performance of their responsibilities however should also provide useful information for PPC to manage their service performance.

B.11 Monthly Reporting

(1) PPC shall deliver the monthly reports set out in this Section B.11 to City five Business Days following the last day of the month. In all cases, reported information should include comparisons to previous months and previous year where available, provide information in graphic formats and be accompanied by analysis and plans for improvement or change where relevant.

(2) City will review the report within 10 Business Days following receipt of the report and notify PPC of any errors or omissions or changes it deems required.

B.11.1. Performance Monitoring Report

(1) PPC shall prepare a monthly report of the Performance Monitoring Program (the "Performance Monitoring Report"), comprised of a summary of all Service Failures and Availability Failures and the related performance details and applicable financial adjustment to the invoice in accordance with Exhibit 4 (Payment Schedule)

(2) For each Contract Quarter, the Performance Monitoring Report shall present quarterly information to support the invoicing and payment of Quarterly Availability Payments in accordance with Exhibit 4 (Payment Mechanism). This Quarterly Performance Monitoring Report shall be a roll-up of the preceding months' information as outlined above in Section B.11.1(1).

B.11.2. Operational Report

(1) PPC shall prepare a monthly operational report with the following:

(a) An executive summary.

(b) A summary of major activities and issues during the past month for each IFM Service category as well as general responsibilities such as quality, risk management, OH&S, Contractor procurement and management, etc.

(c) A summary of all demand requests with statistics, graphs and analysis of trends and action to be taken based on the results.

(d) Human resources reporting including training, orientation, certificates, personnel and organizational changes, etc.

(e) Statutory compliance.

B.11.3. Maintenance Status Report

(1) PPC shall provide a monthly report detailing the following:

(a) Past month's performance on Demand Maintenance

(b) Past month's performance on Scheduled Maintenance

(c) Monthly Scheduled Maintenance activities for the upcoming month.

B.11.4. Renewal Work Report

(1) PPC shall provide a monthly report detailing the following:

(a) Completed Renewal Work projects year-to-date.

(b) Renewal Work activities for the upcoming month.

B.12 Annual Reports

(1) City will review the report within 20 Business Days following receipt of the report and notify PPC of any errors or omissions or changes it deems required. In all cases, reported information should include comparisons to previous Contract Year, provide information in graphic formats and be accompanied by analysis and plans for improvement or change where relevant.

B.12.1. Annual IFM Services Report

(1) The Annual Summary report shall be provided by PPC to City no more than 20 Business Days following the completion of each Contract Year. This report shall be in a similar format to the Monthly Reporting however with an annual summary of results and information.

B.13 Annual Scheduled Maintenance & Renewal Work schedule

(1) PPC shall provide the annual Scheduled Maintenance schedule one month prior to the end of each Contract Year outlining major maintenance activities planned for the next Contract Year that may impact SFMTA O&M Services.

(2) PPC shall provide a planned Renewal Work schedule to the City each Contract Year on a date to be agreed with the City. This schedule shall include the proposed start and completion dates of each project.

B.14 Risk Management

(1) PPC shall review their services and identify areas of risk and put risk management plans in place to mitigate the risks.

(2) Where PPC identifies any risk or issue that may affect SFMTA O&M Services, whether within the service responsibility of PPC or not, PPC will report the risk to City.

B.15 Document Management

(1) Without limiting Article 21 of the Agreement, PPC shall manage all documentation related to the Infrastructure Facility and ensuring documents are well organized, stored, secured, backed-up, maintained and eventually handed over to City.

(2) All information is to be made available to City in non-proprietary format. Where the operational processes use a proprietary format, such as facility management software, PPC shall ensure that information can be extracted and provided in a non-proprietary format that meets the requirements of City.

(3) PPC shall ensure that all relevant literature from suppliers and manufacturers required in the normal course of providing the IFM Services is obtained, updated and stored appropriately.

(4) PPC shall manage and maintain at the Infrastructure Facility up-to-date copies of all applicable literature, records, permits, licenses and approvals and other documentation related to IFM Services.

(5) Prior to providing any information required under Applicable Law and Standards to the appropriate Governmental Entity(ies), PPC shall provide a copy to City in advance for review and approval. This requirement shall not mitigate PPC's responsibilities under Applicable Law and Standards to deliver information to the appropriate Governmental Entity(ies) within the required timelines.

B.16 Quality & Performance Management Services

B.16.1. General Requirements

(1) PPC shall develop, maintain and implement a system for managing quality for all services recording and acting on occupant feedback and satisfaction with respect to the IFM Services.

B.16.2. IFM Quality Management Plan

(1) PPC shall implement an IFM Quality Management Plan to manage and measure the quality of IFM Services.

(2) The Quality Management Plan shall include the following, in accordance with accepted quality management processes and systems and Good Industry Practice:

(a) A commitment to quality.

(b) An overview to describe the PPC's approach to maintaining and managing the quality system.

(c) The roles and responsibilities of individuals and management related to managing quality.

(d) Records management requirements for the quality management system, including managing procedures and policies.

(e) Quality processes, including measuring, testing, reporting and acting on quality and performance management results.

(f) Inspection and auditing process to test quality and adherence to established procedures.

(3) PPC shall conduct quality audits of each service in accordance with its Quality Management Plan at least annually. The IFM Provider shall report on the results of the quality audits in the month following the audits.

B.17 Occupant Satisfaction Surveys

(1) PPC shall propose the questions and methodology for City approval and agreement of the occupant satisfaction surveys at least two months in advance of the survey being conducted. PPC shall adjust their survey based on City's comments. The occupant satisfaction survey questions are to remain the same in future years unless approved by City.

B.17.1. Occupant Satisfaction Surveys:

(1) PPC shall conduct occupant satisfaction surveys of City employees annually commencing within the first 6 months after Substantial Completion Deadline and cover each of the relevant IFM Services for which City employees would be able to provide an opinion.

(2) Subsequent survey shall be conducted annually unless otherwise directed by City to conduct the survey at a frequency less than annually.

(3) The occupant satisfaction survey shall be distributed to all City employees at the Infrastructure Facility using a web-based survey methodology, supplemented with paper surveys where necessary. The methodology shall be discussed with and agreed by City.

B.17.2. Transaction Satisfaction Surveys:

(1) PPC shall conduct Transaction Surveys within 3 months after Substantial Completion Deadline. Transaction surveys may be ongoing or conducted at a minimum quarterly during the IFM Period and cover at least 15% of all transactions (Help Desk calls or web requests) quarterly.

B.17.3. Baseline Survey Results

(1) The first survey results shall become the baseline survey for performance management purposes.

(2) Every 5 Contract Years, the baseline for each separate service category is reset to the average of the previous 5 Contract Years.

B.17.4. Satisfaction Survey Report

(1) PPC shall:

(a) Provide survey results and analysis to City within one Month of the close of the survey for the occupant satisfaction survey or within one Month after each Quarter for the Transaction Survey.

(b) Provide an action plan to City within 45 days of the close of the survey for any of the following conditions:

i. Overall average below that of the previous survey.

ii. Specific services/questions below the results from the previous survey

iii. Specific services/questions below the overall average of the current survey.

iv. Conditions identified as being of specific concern to City.

(c) Review and agree with City on the action plan steps and activities to be implemented along with timelines to improve satisfaction results.

B.17.5. City Surveys

(1) City may choose to administer surveys of its own or in participation with other organizations. The surveys may include questions related to the IFM Services.

(2) City may request that PPC prepare Performance Action Plan(s) where applicable.

(3) PPC will provide the action plan within fifteen (15) Business Days of receiving the request from City. The action plan will summarize the results, identify areas for improvement and indicate strategies to be used to improve results, including the timeframe for implementation.

B.17.6. City Inspection and Audit

(1) PPC shall, within twenty-four (24) hours' Notice from City:

(a) permit City to access, review, inspect and audit the Infrastructure Facility and PPC's service delivery related records, information, reports and other Books and Records maintained by PPC to confirm that:

i. the Performance Monitoring Program adequately stores information and has the capacity to generate reports readily available for audit.

ii. the Infrastructure Facility is being maintained in accordance with the terms of the Agreement.

iii. PPC is otherwise meeting its obligations under the Agreement related to the IFM Services.

(2) PPC shall assist City with any audit or inspection of the Infrastructure Facility, the IFM Services, or the Performance Monitoring Program.

B.18 Performance Monitoring Program

(1) PPC shall monitor performance of IFM Services including Availability Failures and Service Failures and provide a Performance Monitoring Report for results in the month within five business days of the end of each month.

(2) The Performance Monitoring Report shall document all results and related Availability Failures or Service Failures along with the related Deductions in accordance with Exhibit 4 (Payment Mechanism.)

(3) The Performance Monitoring Report shall also include a space trending report showing space temperatures during the period and identifying any rooms which have missed the required Performance Requirements.

B.18.1.1. Priority Descriptions

(1) The following describe the basis for establishing the priority for application to the Response Times and Rectification Times.

(a) **Priority 1 –** Situations requiring immediate action to return the Infrastructure Facility to normal operations, stop accelerated deterioration, or correct a safety hazard that imminently threatens life or serious injury to public and/or City employees.

(b) **Priority 2 –** Situations that will imminently become critical, if not corrected expeditiously, includes intermittent interruptions and/or potential safety hazards.

(c) **Priority 3 –** Conditions requiring appropriate attention to preclude deterioration or potential downtime and associated damage or higher costs if deferred further. Items representing a practical improvement to existing conditions. These items are not required for the most basic functions of the Infrastructure Facility but will improve the overall usability and accessibility and/or reduce long-term maintenance.

B.18.1.2. Response and Rectification Times

Category	Response Time	Rectification Time
Priority 1	15 minutes	4 hours (for all Functional Component Rank categories)
Priority 2	The longer of 30 minutes or prior to the resumption of core work hours	The longer of 8 hours or prior to the resumption of core work hours (for all

Category	Response Time	Rectification Time
		FunctionalComponent Rank categories)
Priority 3	The longer of 2 hours or prior to the resumption of core work hours	7 calendar days

B.18.1.3. Availability Failure Response and Rectification Times

Functional Component Rank Category	Response Time	Rectification Time
5	15 minutes	4 hours
4	15 minutes	8 hours
3	The longer of 30 minutes or prior to the resumption of core work hours	12 hours
2	The longer of 30 minutes or prior to the resumption of core work hours	24 hours
1	The longer of 60 minutes or prior to the resumption of core work hours	48 hours

B.18.2. Performance Action Plans

(1) Where the City (directly or through the PPC) observes a significant or consistent non-performance on any IFM Services, the PPC shall prepare a Performance Action Plan ("PAP"), upon request by the City. The PAP will be due either five Business Days from the request or an alternate later date as identified by City.

(2) The PAP submitted to City will, at a minimum, contain a summary of the issues raised by City, an analysis of the root causes of the issues, the steps that will be undertaken by PPC to address the issues and specific timeframes for such steps.

B.19 Help Desk Services

B.19.1. General Requirements

(1) PPC shall ensure the Help Desk acts as a method to receive, track and dispatch Service Requests as well as managing various communications, tracking work activity, reporting and analysis of Service Requests.

(2) PPC shall work with City when developing Help Desk procedures to develop a listing of typical Priority 1, Priority 2 and Priority 3 issues and use this as a training tool with the Help Desk agents and City staff as appropriate to ensure accurate and timely categorization of Service Requests.

B.19.2. Hours and response requirements

PPC shall ensure:

(1) The Help Desk shall be available and receive phone calls 24 hours a day, 365(6) days a year. In addition, web access to the Help Desk for users to enter web Service Requests shall be available 24 hours a day, 365(6) days a year.

(2) The Help Desk agent shall respond to all enquiries and Service Requests, track all calls with information as required further below, prioritize the calls in accordance with these Technical Requirements and dispatch to a qualified resource to address the Service Request.

(3) All calls to the Help Desk shall be answered by an agent within 30 seconds. Web Service Requests are to be acknowledged via email to the requestor within 15 minutes.

(4) There is a backup Help Desk available in the event that the main Help Desk becomes unavailable.

(5) It communicates the Help Desk contact number and web address to City employees and re-communicate as needed periodically to ensure occupants and City employees are reasonably informed.

(6) The Help Desk allows Failure Events to be reported by the City to the Help Desk as soon as possible after City becomes aware of the Failure Event.

(7) All service requirements and Failure Events identified at any time by PPC or its Contractors shall be promptly reported to the Help Desk.

City shall make reasonable efforts to route issues identified by employees through their supervisors or administrative resources who will then call or enter a web request on their behalf for non-emergency Service Request calls to moderate and consolidate the number of calls for Priority 2 or Priority 3 Service Requests.

B.19.3. Information Requirements

(1) PPC shall use a system to receive, track, record, take action and report on Service Requests of all types.

(2) Help Desk data and reports shall be made available to City on-line with read-only access to the software used by PPC.

(3) PPC shall ensure the Help Desk provides emergency incident support by raising alarms, reporting events to internal and external authorities and logging details of emergencies.

(4) The Help Desk shall ensure the information of all Service Requests and calls are tracked. This includes the following:

(a) Help Desk operator's name or other identifier;

(b) Requester's name;

(c) Date and time of request;

(d) Affected location as relevant;

(e) Repair or correction required;

(f) Service Failure, and/or Availability Failure;

(g) Event Category (Priority 1, Priority 2 or Priority 3);

(h) Unique request reference identifier;

(i) Employee or Contractor and contact info to which the request was dispatched;

(j) Date and time request was dispatched;

(k) Action taken and by whom;

(l) Response Time and Rectification Times; and

(m) Duration of Availability Failure.

(5) PPC shall not delete or alter any details recorded by the Help Desk unless approved in writing in advance by City and the following information is recorded:

(a) The exact nature and impact of the alteration or deletion;

(b) The reason for the alteration or deletion; and

(c) The name of the person who authorized the alteration or deletion.

B.19.4. Redirection

(1) When calls or web Service Requests are received by PPC for activities that are not within PPC's scope or responsibility, PPC shall redirect the calls or Service Requests based on the redirection guidance provided by City. This may be to provide an alternate number or web link for the requestor to contact or, if possible, transfer them to another extension if the request is by phone.

(2) PPC shall log these Service Requests along with customer information and who they were redirected to and the date/time within their CAFM system for verification of the redirection and for reporting of redirections to City as part of Help Desk reporting.

B.19.5. Reporting

(1) PPC shall report all Help Desk activities and performance within the required reports outlined by this specification. This will include analysis and action plans based on the results.

B.20 Computer Aided Facility Management System (CAFM)

B.20.1. Infrastructure Facility Management

(1) The PPC shall utilize a CAFM as the basis for development of the Asset Management Plan and specifically to manage the Infrastructure Facility. The CAFM shall be developed in coordination with the Project's BIM. City will have access to the Infrastructure Facility's CAFM for auditing purposes and submission of task orders into the system.

(2) The CAFM system, including hardware and software, shall allow for the following Infrastructure Facility management functions:

(a) Long-range and annual Infrastructure Facility planning.

(b) Infrastructure Facility financial forecasting.

(c) Work specifications, installation, and space management.

(d) Architectural and engineering planning and design, with floor plans, area and room numbers, doors, keys and key card access system.

(e) New construction and/or renovation.

(f) Maintenance and operations management, including both Scheduled Maintenance, Demand Maintenance and Renewal Work.

(g) IFM Services order execution and organization.

(h) Materials purchasing.

(i) Spare parts inventory management.

(j) Telecommunications integration, security, and general administrative services.

(k) Sustainability monitoring, reporting, and forecasting.

(l) Subcontracts, suppliers, and personnel management.

(m) Customer satisfaction auditing.

(n) Document management.

(o) Interface with BAS (described below).

B.20.2. CAFM Interface with Hexagon EAMS

(1) PPC shall work with City to enable City to implement an integration within their system between the PPC system and City's existing EAMS system.

(2) The intent is to achieve the following:

(a) Reduce the necessity for City staff to use two systems.

(b) Enable the creation of a Service Request in City's system that will automatically populate the PPC system and be managed by PPC as if it was entered through PPC's Help Desk or from within the PPC system.

(c) Ability for City to check status/updates to PPC's system's work order from within the City system as well as the ability to generate reports.

B.21 Utilities Management Services

B.21.1. General Requirements

(1) PPC shall manage Utilities to meet the requirements of SFMTA O&M Services in consultation with City, including managing utilities in an efficient, economical manner with due regard for initial design, LEED designations and environmental responsibility, in accordance with Exhibit 12 (Energy Management).

(2) PPC shall ensure connections to Utility Owner are maintained 24 hours per day, 365(6) days per year to appropriate Technical Requirements and adequate capacity to meet the requirements of City, including provisions for backup in accordance with the design requirements.

B.21.2. Management

(1) PPC Shall monitor, plan and inform City of all scheduled interruptions that may impact SFMTA O&M Services immediately upon notice related to the Utility Owner, and managing the impact of the interruptions to minimize the disruption.

(2) PPC shall interface with the Utilities providers as needed, including receiving and posting/administering all notices related to utility services.

B.21.3. Energy Conservation

(1) PPC shall developing and implementing, with City input, an awareness and communication plan to promote conservation initiatives.

B.21.4. Analysis and Reporting

(1) PPC shall:

(a) Monitor all consumption and provide reporting in compliance with Exhibit 12 (Energy Management)

(b) Maintain a database of all consumption related information, including historical data from Substantial Completion. The database must be made available to City on request in a non-proprietary format, downloadable into Microsoft Excel or similar spreadsheet software as designated by City.

(c) Advise City on consumption and cost implications for SFMTA O&M Services requirements, process changes, modernization, equipment changes or renovations.

(d) Prepare, maintain and provide all information, including historical and statistical records, consumption data, meter readings and related building operations data as may be reasonably required by City for their own purposes or by Authorities related to legislative requirements.

B.22 Environmental Management Services

B.22.1. General Requirements

(1) All IFM Services shall be performed in accordance with PPC's Environmental Management System to minimize environmental impact and minimize impacts on the health of Building Occupants.

(2) PPC shall provide an annual environmental compliance statement in a form acceptable to City.

B.22.2. Environmental Management System

(1) PPC shall have in place and follow an Environmental Management System that includes relevant policies and processes to address the following areas:

(a) Energy conservation.

(b) Water conservation.

(c) Greenhouse gasses emission reduction.

(d) Green materials use.

(e) Halocarbons management.

(f) Storage tank management (fuel, lubrications, chemicals, etc.).

(g) Potable water quality management.

(h) Indoor air quality management.

(i) Material storage and use.

(j) City employee communications.

(k) Training.

(l) Testing, inspection and auditing.

B.22.3. Environmental Conditions

(1) PPC shall deliver services using environmentally responsible processes, materials, equipment and supplies to minimize effects on the environment.

(2) PPC shall develop and implement a procurement policy that encourages environmentally friendly product and material selection and use and service delivery from subcontracted services.

(3) PPC shall conduct a minimum of annually IAQ testing as well as IAQ tests where IAQ complaints are made or persistent IAQ issues are observed in order to identify and rectify the source of the complaint.

B.22.4. LEED

(1) PPC shall manage services to maintain the standards initially required to meet the LEED certification requirements, including when implementing maintenance, renewal projects and operational practices.

(2) PPC shall obtain LEED EBOM certification, commensurate with the LEED NC certification obtained after the construction period, within five years of Substantial Completion of the Infrastructure Facility and maintain the certification throughout the IFM Period.

B.23 Emergency Management Services

B.23.1. General Requirements

(1) PPC shall be responsible for Infrastructure Facility operations and related contingency response during an emergency. This includes all resources necessary as they relate to IFM Services, in coordination with City as required during an emergency.

(2) In collaboration with City, PPC shall develop Emergency management and contingency plans and protocols, including decision making, for the IFM Project Site related to PPC's responsibilities that tie in with City's own emergency management plans and meet City's emergency management requirements.

(3) PPC shall provide to City an up-to-date contact list of employees and Contractor employees, including afterhours contact information. City shall provide PPC with an up-to-date contact list of City contacts, including afterhours contact information.

(4) PPC shall conduct an operational risk assessment within 3 months before and then revised no later than 3 months after Substantial Completion Deadline to identify risks that have the potential to impact SFMTA O&M Services. This assessment will result in a report to City, identifying risk, impact, likelihood and mitigation. Specific areas of risk may require a management plan by City. The assessment will be updated as required if there are material changes that impact the operational risk profile.

(5) PPC shall develop an Earthquake Inspection Plan to minimize delay in re-occupying the Infrastructure Facility follow in significant seismic event as part of the City of San Francisco's Building Occupancy Resumption Program (BORP), developed and maintained by the City of San Francisco.

B.23.2. Emergency Response

(1) PPC shall respond and address emergency requirements at the IFM Project Site with sufficient resources as necessary.

(2) PPC shall have in place specific response and mitigation plans for all possible emergency situations that may impact IFM Services or impact SFMTA O&M Services. This includes:

(a) Utility disruptions.

(b) Natural disasters.

(c) Flood/Water leaks.

(d) Heating/Cooling failure.

(e) Weather Events.

(f) Bomb threats.

(g) Fire (including evacuation plan).

(h) Environmental spill / Hazardous Material release.

(i) Medical emergency.

(j) Structural collapse.

(k) Pandemics.

(3) PPC shall provide an emergency action report following an Emergency that outlines the emergency, action taken and recommended mitigation to prevent future occurrences.

(4) PPC shall provide all necessary assistance to facilitate activities associated with post- event reoccupation including inspections (as part of the City of San Francisco's Building Occupancy Resumption Program (BORP), developed and maintained by the City of San Francisco).

B.23.3. Contingency Planning

B.23.3.1. IFM Project Site Based

(1) PPC shall have in place contingency plans for common failures or external events that impact the delivery of IFM Services (including such events that have a corresponding impact on the SFMTA O&M Services). This includes events such as power failure, leaks, chiller failure, water supply failure, lighting failure, natural disasters, pandemics, heating failure, etc.

(2) PPC shall work with City to integrate their contingency planning with City's contingency plans to ensure they align with City requirements.

B.23.3.2. PPC Business / Services

(1) PPC shall have in place contingency plans for IFM Services including for related services and processes that have the possibility of impacting the Infrastructure Facility.

B.24 Fire Management & Evacuation

(1) PPC shall develop fire management and evacuation plans for the Infrastructure Facility and the IFM Project Site in conjunction with City.

(2) PPC shall submit the fire safety and evacuation plan to the local fire authorities in accordance with legislative requirements prior to Substantial Completion Deadline. PPC will keep the plan up-to-date and make changes as needed to accommodate SFMTA O&M Services.

(3) PPC shall organize, plan and implement fire drills with the involvement and cooperation from City. Timing of training and fire drills is to be agreed by City.

(4) PPC shall provide training for City and fire warden representatives.

B.25 Move-In Services

B.25.1. General Requirements

(1) PPC shall provide resources to plan, coordinate, manage and execute the physical move-in into the Infrastructure Facility and represent PPC on the Move-In Committee no later than eight months prior to Substantial Completion Deadline.

(2) The Move-In Resource shall manage PPC's Move-In and integrate with City and other parties for all activities of PPC's Move-In. The Move-In Advisor will also interface with City and related Move-In Subcommittee for the Move-In of SFMTA O&M Services from the current location to the Infrastructure Facility.

(3) PPC shall develop and submit a Move-In Plan related to their services to City no later than six months prior to Substantial Completion Deadline. PPC shall develop the plan with the input and involvement of City and take into account the SFMTA O&M Services.

(4) The Move-In Plan shall include:

(a) Implementation plan for the IFM Services.

(b) A timetable for completion of all activities required for Move-In in traditional project schedule format.

(c) Information and input required from City.

(d) Communication plans for City employees, Contractors, etc.

(e) Timelines for all documents and plans required by these IFM Specifications.

(f) Development of processes and procedures in conjunction with City, including change management interaction with City.

(g) Information requirements and transfer.

(h) Progress meeting schedule.

(i) Status and reporting mechanism.

(j) Resourcing requirements, including Move-In staff, hiring and procurement of Contractors.

(k) Training and orientation of PPC, Contractors and relevant City staff.

(5) The IFM Resource and key operational staff shall be hired and at the Infrastructure Facility during the Move-In period sufficiently in advance to enable a smooth Move-In and ensure training and orientation on facility systems, SFMTA O&M Services and participate in commissioning activities. At a minimum before Substantial Completion Deadline:

(a) IFM Manager no less than six months in advance.

(b) Move-in Resource no less than eight months in advance.

(c) Operational and technical staff no less than two months in advance.

(d) Admin/support staff no less than two weeks in advance.

Section C - IFM Project Site & Infrastructure Facility Operations

C.1 Security Services

C.1.1. City Security Services

(1) City is responsible for physical security related to the Infrastructure Facility, including exterior security.

(2) City is responsible for monitoring the following [at the Infrastructure Facility] and initiating action, as required, including notifying PPC as necessary for the following:

(a) Intrusion alarms.

(b) Access control system.

(c) Fire alarms and initiating automated announcements as required. PPC is responsible for monitoring the fire panel alarms and trouble alerts.

(d) CCTV.

(e) Elevator emergency phone and any related elevator emergency alarms.

(3) City is responsible, as a user of the security access system, for providing and issuing access cards to City and PPC personnel. PPC shall submit requests to the City for access for their personnel.

(4) City is responsible for providing and issuing keys to City and PPC personnel for Maintenance and Transit Spaces and Office / Admin and Training Spaces. PPC shall submit requests to the City for access for their personnel.

C.1.2. PPC Security Services

(1) PPC is responsible for:

(a) Providing access and training to the City on the CCTV, intrusion alarm and access control system for coordination and enabling the City to monitor their responsibilities.

(b) Securing any doors or windows which may present a security risk and advising the City of this breach of Security.

(c) Receiving notification from the City of any incident brought to City’s attention and take action to investigate, report and mitigate.

(d) Communicating with and identify security issues or suspicious activity, including potential criminal activity (including graffiti and other forms of Vandalism), as required based on the nature of the issue and in accordance with established procedures, immediately upon discovery and taking independent action and/or direction as necessary regarding these security issues.

(e) Providing and issuing keys to City and PPC personnel for PPC Spaces.

C.1.3. Security Systems Training

(1) PPC shall ensure City Personnel are trained on the safe and effective operation of all security and surveillance systems installed at the Infrastructure Facility and changes to these systems by:

(a) Conducting initial training of City's personnel both SMFTA employed or contracted on the safe and effective operation of security and surveillance systems and equipment (including making changes to CCTV camera settings and alarm parameter settings) and ensuring that City is capable of training new City Personnel on security and surveillance systems (including the provision of training resources accepted to City).

(b) Coordinating with City and conducting the initial training to City Personnel on new, revised or replacement of security and surveillance systems, equipment, or software as they come online.

(c) Initiating additional training / retraining to City Personnel for security and surveillance systems and equipment on an annual basis.

C.1.4. Surveillance and Alarm Systems:

(1) PPC shall Respond to and act on alarm conditions in accordance with emergency management plans established in conjunction with City.

(2) PPC shall reset the fire alarm and any systems that are connected to the fire alarm when cleared by the Fire Department.

(3) PPC shall maintain and update all firmware and software of the active equipment on a regular basis or as required by the system manufacturers to keep current. PPC shall ensure that the software, hardware and physical elements, including security features, access doors and related security devices and systems (including cameras and alarms) are functional and do not encourage or enable security risks or intrusions to the Infrastructure Facility. Records of software versions shall be kept up to date and available for verification at all times.

C.1.5. Incident Reporting, Emergency Assistance and Crime Prevention

(1) PPC shall:

(a) Summon the police where a crime is committed, where a crime is suspected of being committed or in any other situation where Police Service assistance is required.

(b) Respond to any alarm activated by any security system or any request for assistance by any user anywhere in the Infrastructure Facility or on the IFM Project Site immediately. In any case attend at the Infrastructure Facility of the alarm or request, as appropriate.

(c) Develop and implement a risk assessment plan to deal with all security matters which may occur at the Infrastructure Facility in consultation with City, including, terrorism, Vandalism, and serious assault (including sexual assault) on any Building Occupants or their property. This plan is to be reviewed at least annually with City and any relevant authorities.

C.1.6. Access Control

(1) PPC shall ensure that access keys/key cards issued to any PPC-Related Entity by the City are tracked and managed to maintain security and not lost or misplaced and are not used by unauthorized persons.

(2) If any PPC-Related Entity misplaces keys which then requires re-keying to maintain a secure facility, PPC will pay for the cost of any re-keying services.

C.2 Solid Waste Collection, Recycling, & Removal Services

C.2.1. General Requirements

(1) City shall:

(a) collect, store and remove from the IFM Project Site all City generated waste.

(b) confidentially shred, remove and dispose of shredded materials related to their own operations from the Infrastructure Facility.

(c) collect, store and dispose of waste arising from SFMTA O&M Services, including that from the Office/Admin and Training Spaces.

C.2.1.1. Bus & Maintenance Waste

(1) City shall collect, store and dispose of waste, arising from SFMTA O&M Services. City shall also dispose of waste collected by PPC under Section 2.1.1(2)(b).

(2) PPC's shall:

(a) Collect and store from the IFM Project Site all waste generated by PPC in the performance of IFM Services.

(b) Transfer collected waste into City bins within the centralized waste storage areas.

(c) At all times, keep the Infrastructure Facility free from accumulations of waste materials, recyclable materials or rubbish.

(d) Collect, store and dispose of all excessive construction waste generated by PPC in performance of IFM Services.

C.2.1.2. Hazardous Waste

(1) City shall collect, store, and dispose of Hazardous Waste generated by SFMTA O&M Services with the appropriate health and safety measures at all times.

(2) PPC shall be responsible for Hazardous Waste used by PPC in the performance of IFM Services as well as typical Hazardous Waste generated from PPC office activities and from PPC equipment.

(3) PPC's Hazardous Waste shall be properly stored, secured and disposed of through approved, certified waste handlers.

(4) PPC shall provide a list of hazardous waste materials and typical volumes stored on the IFM Project Site to City annually, with updates whenever the list of waste materials changes.

(5) PPC shall track the collection and disposal of hazardous waste materials and provide the paper trail demonstrating proper handling and disposal to City on request.

C.3 Pest Control Services

C.3.1. General Requirements

(1) PPC shall develop and implement a pest control procedure to provide routine preventive and reactive (on-call) pest control services in an integrated manner. In particular, implement aggressive application of best practices for humane and effective abatement and deterrence measures for pigeons and other birds.

(2) PPC shall provide a quarterly chemical usage report detailing actual chemicals, volumes, and/or equipment containing chemicals and devices used including providing all safety data sheets as well as providing a monthly inspection report as part of the regular monthly meetings.

(3) PPC shall provide a quarterly bird and pest control report detailing bird and pest abatement and deterrence measures and the ongoing maintenance of the relevant measures installed in the Infrastructure Facility

(4) Pest Control services shall be designed to minimize environmental impact, be humane and maximize effectiveness, including both preventive and reactive control methods for all types of pests, including insects, rodents, birds or larger animals.

(5) Where chemical treatments are applied, they shall be strictly controlled and monitored. PPC shall advise City in advance of their application, provide the safety data sheet and it's specific usage and application. Where requested, PPC will prepare a communication / notice for City employees prior to application. City reserves the right to approve or deny use of any chemical treatments.

C.4 Maintenance Services

C.4.1. General Requirements

(1) PPC shall properly maintain the Infrastructure Facility and the IFM Project Site to ensure that they:

(a) Meet these IFM Specifications and Technical Requirements;

(b) Meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(2) PPC shall maintain the IFM Project Site to ensure that:

(a) Concrete, asphalt or other hard surface materials have no uneven surfaces resulting in tripping hazards, spalling, holes, damaged or broken curbs and are free of potholes, open cracks, and sinking;

(b) Curbs and edgings are sound, with no chips, cracks, breaks;

(c) All areas drain as set out in these IFM Specifications and otherwise as required by the Technical Requirements;

(d) The drainage system, including all gutters and drains, are kept clean and unblocked and function in accordance with these IFM Specifications and otherwise as required by the Technical Requirements;

(e) All roadway, lane and parking lot lines are clear and complete;

(f) All roadway, lane, parking and pedestrian areas are swept and/or power washed annually at a minimum to remove accumulated materials and clean the surfaces.

(g) Barrier-free access is maintained, where applicable;

(h) Exterior signs including informational, directional and parking signs are legible, free from rust, corrosion, peeling or fading, with all posts maintained plumb;

(i) Exterior structures including flagpoles, fencing, railings, bicycle racks and exterior wall signage are safe, sound, secure, operational and free from rust, corrosion, peeling or fading;

(j) Flagpoles are maintained plumb;

(k) Fencing and gates are sound, free from rust, corrosion or peeling, not sagging and gates function as required; and

(l) Permanently fastened fixtures are maintained in a safe condition, securely fastened and free from rust, corrosion or peeling.

C.4.2. Landscaped Areas

(1) The landscaped areas include all grass, trees, shrubs and other decorative plants at the Infrastructure Facility.

C.4.3. Maintenance Requirements:

(1) PPC shall properly maintain the landscaped areas to ensure that the landscaped areas:

(a) Meet these Technical Requirements;

(b) Meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(2) PPC shall maintain the landscaped areas to ensure that:

(a) The landscaped areas free from visible weeds and are in a healthy growing condition, with edges neatly trimmed;

(b) Trees and shrubs are regularly pruned and fertilized, with dead growth removed;

(c) Dead or diseased trees or shrubs are promptly removed and replaced, as required;

(d) Tree and shrub growth does not interfere with walkways and does not cause a safety hazard or become unsightly;

(e) Mulch or other ground cover is in place with uniform and complete coverage;

(f) All landscaped areas drain as required in these IFM Specifications and otherwise as required by the Technical Requirements;

(g) Edging is completed once per month or more frequently as needed to meet the obligations in (a).

(h) Grass height is maintained between 2.5 and 3.0 inches;

(i) Fertilizer is applied as required to maintain healthy growth;

(j) Cleaning following the winter season to remove accumulated leaves, trash and other debris from landscaped areas and hard surface areas; and

(k) Aerating is done annually.

(3) PPC shall monitor the landscaped areas in accordance with PPC's Maintenance Plan. All replacement shrubs, trees or decorative plants shall meet these Technical Requirements and relevant Regulatory Approvals.

C.5 Cleaning Services

C.5.1. City Provided Cleaning

(1) Except as set out in Section C.5.2, below City provides cleaning services for SFMTA O&M Facilities.

C.5.2. PPC Provided Cleaning

(1) PPC shall provide cleaning services as provided in this Section C.5.2 for the PPC Spaces as defined in Appendix D and will include :

(a) All specialty interior areas of the building that are designated for the PPC's use in providing the IFM Services.

(b) Electrical and mechanical rooms.

(c) Service spaces.

(d) Utility closets (except for custodian closets, which are the responsibility of City.

(e) PPC spaces including designated offices and toilets

(together the "Cleaning Services").

(2) PPC shall provide all interior and exterior window cleaning for the Infrastructure Facility as follows::

(a) Exterior windows for the entire Infrastructure Facility shall be cleaned annually.

(b) Interior windows shall be cleaned semi-annually at a minimum, or as required, for PPC Spaces.

(3) PPC shall provide Cleaning Services to all areas and elements within PPC Spaces that cannot be accessed without the use of tools or specialized equipment including:

(a) Entrance grills and drains.

(b) Glazing, finishes, walls, rails and other architectural elements that require special equipment (including lifts) to access or to clean.

(4) PPC shall provide deep cleaning services which are part of the overall preventative maintenance for the Infrastructure Facility, including:

(a) An annual power-sweeping / power washing of the entire parking and maintenance bay areas.

(b) Grease, oil drippings and other stains are to be removed twice per Contract Year with an appropriate degreaser except in Bus parking and maintenance areas.

(5) Where City conducts cleaning services for surfaces, fixtures, equipment or other assets for which PPC is responsible for maintenance, repair and Renewal Work, PPC shall provide City employees or contractors with appropriate training and guidance on the techniques and products to use in the care of all surfaces, fixtures, and in-contract equipment. If at any time, PPC believes that the maintenance, repair or Renewal Work is being negatively affected by City's cleaning activities, PPC shall immediately identify and notify City in writing their concerns and work with City to rectify or mitigate. If PPC fails to immediately notify City in writing then City shall not be responsible for any maintenance, repair or Renewal Works costs that may result from City cleaning activities.

C.6 Maintenance Services

C.6.1. As Built & Drawing Management

(1) All As-Built Drawings shall be updated by PPC as required to reflect the Maintenance Services, Renewal Work, or Changes to the Infrastructure Facility. The City will be responsible for making updates, as required, to reflect changes made through SFMTA O&M Services and notify the PPC of such updates. City will not update As-Built Drawings for minor changes to FF&E. The maximum time for completing such updates to the As-Built Drawings shall be two months after completion of the work.

(2) All drawings shall be maintained by PPC in an electronic format and available in non-proprietary format and access is to be provided to City when requested.

(3) In addition, PPC shall maintain electronic files and any paper copies in well-organized and indexed system in searchable format. The electronic files must be backed-up off-Infrastructure Facility.

C.6.2. Commissioning

(1) Commission or re-commission components or systems shall be performed following Maintenance Services based on Good Industry Practice and in particular where they may impact operational efficiency or effectiveness of the system or component.

(2) Commissioning plans are to be provided to the City for review.

(3) Results of commissioning activities are to be provided to City for their information.

C.6.3. Scheduling of Maintenance Services

(1) PPC shall provide City with a monthly schedule at least 1 month in advance of Scheduled Maintenance activities being carried out.

(2) PPC may only carry out its Maintenance Services obligations as follows:

(a) Demand Maintenance required to address an Emergency may be undertaken by PPC as needed to protect life and property. PPC Shall notify the city as soon as possible before or after the Demand Maintenance in accordance with agreed communication plans.

(b) Maintenance Services which do not impact SFMTA O&M Services can be undertaken at any time.

(c) If PPC has Scheduled Maintenance and City determines that it will disrupt SFMTA O&M Services or other City planned activities and requests PPC to modify its maintenance schedule or activities, then PPC will accommodate such change in the performance of its Maintenance Services obligations unless otherwise approved by City.

C.6.4. Graffiti & Vandalism

(1) PPC shall work jointly with City to minimize and appropriately manage acts of graffiti and Vandalism.

(2) PPC shall remove graffiti that is publicly visible or offensive within 24 hours. All other graffiti shall be removed within 72 hours.

(3) PPC shall repair and rectify all acts of Vandalism based on the Response Time and Rectification Time and the Vandalism's classification as Priority 1, Priority 2 or Priority 3 depending on the Vandalism's impact on the Infrastructure Facility or SFMTA O&M Services.

C.6.5. Demand Maintenance Activity

(1) PPC shall respond to Demand Maintenance requests or requirements as they are identified, whether from City, Building Occupants or as a result of PPC activity.

(2) PPC shall ensure all Demand Maintenance activity is documented and tracked electronically in the Help Desk system for performance evaluation and to provide information for analysis and reporting. Where relevant, Demand Maintenance activity shall be documented with the relevant asset receiving Demand Maintenance activity.

C.6.6. Scheduled Maintenance Activity

(1) PPC shall provide a comprehensive Scheduled Maintenance program with Scheduled Maintenance activities for all Maintained Elements and also legislative compliance routines and major activities for all IFM Services.

(2) All relevant assets shall be included in a CAFM to track both Scheduled Maintenance and actual work performed, including relevant operational measurements and observations related to the asset receiving Scheduled Maintenance activity.

(3) An annual audit shall be conducted on all assets due no later than the anniversary date of occupancy.

(4) The CAFM system shall track document work orders generated and work orders completed within each planned period for performance reporting.

(5) The CAFM system shall record and maintain the following information on the assets:

(a) A logical, hierarchical based identification method for systems and components.

(b) Description of each system / component, (i.e. make, model, serial #, capacity, etc.)

(c) Physical location of the asset (i.e. room number as relevant)

(d) Scheduled Maintenance tasks with detailed description

(e) Frequency and scheduled dates for tasks / components

(f) Maintenance history including Scheduled Maintenance and Demand Maintenance and Renewal Work activity along with notes, recommendations, observations, etc.

(g) Resources dispatched

(h) Date work order produced, due and completed, for performance reporting purposes

C.6.7. Scheduled Maintenance Plans

C.6.7.1. 1 Year Scheduled Maintenance Plan

(1) PPC shall provide a 1 year Scheduled Maintenance Plan with detailed schedule which highlights IFM Services activities which may impact SFMTA O&M Services, identify implications and provide plans on how the potential impact will be mitigated or eliminated. The 1 Year Scheduled Maintenance Plan is to be provided at least 3 months prior to the start of the Contract Year at the IFM Operations Committee.

C.6.7.2. 5 Year Scheduled Maintenance Plan

(1) PPC shall provide a 5 year Scheduled Maintenance Plan which identifies all major IFM Services activities which may impact SFMTA O&M Services. The 5 Year Scheduled Maintenance Plan is to be provided at least 3 months prior to the start of the Contract Year at the IFM Operations Committee.

C.7 Service & Maintenance Requirements

C.7.1. Infrastructure Facility Envelope

(1) This section refers to all the Elements of the Infrastructure Facility envelope, which include roof systems, walls, doors, and windows, subject to Reasonable Wear and Tear

C.7.2. Roof Systems

(1) A roof is the system of interacting components and materials designed to weatherproof and insulate the top surface of the Infrastructure Facility including all structural components, roof fabric, flashings, copings, vents, drains, stacks, parapets and other penetrations. In addition, the roof system includes eaves and fascia.

(2) PPC shall properly maintain the roof system of the Infrastructure Facility to ensure that the roof system:

(a) Meets the Availability Conditions and Performance Requirements applicable to the roof system;

(b) Functions and operates safely and performs in accordance with these IFM Specifications and otherwise as required by the Technical Requirements;

(c) Meets all Applicable Laws and Standards and Regulatory Approvals; and

(d) Meets the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the roof system of the Infrastructure Facility to ensure that:

(a) The roof is weather tight with continuity of membrane and sealant;

(b) The roof is structurally sound, with a uniform and even surface;

(c) The roof is free of Defects affecting performance or safety;

(d) Coverage is continuous and complete across entire surface of the roof of the Infrastructure Facility;

(e) The roof is free of leaks, damp penetration, spalling, noticeable sagging, decay, cracks, rust, corrosion, damage, distortion or displacement and mold;

(f) All parts of the roof system are tightly fastened and structurally sound;

(g) Eaves and fascia are structurally sound and secure;

(h) Roof drainage is free flowing and performs in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(i) Drains and vents are free of debris and obstruction;

(j) Water is dispersed from the roof in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(k) The insulation is intact, dry and performing in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements; and

(l) Any other performance requirement set out in these IFM Specifications and otherwise in accordance with the Technical Requirements are being met.

(4) PPC shall regularly inspect roof systems in accordance with the Maintenance Plan, including Thermographic scans (and cut samples, if necessary)

C.7.3. Exterior Walls and Foundations

(1) Exterior walls and foundations include all structural components, claddings, cappings, exhaust and supply vents, chimney stacks and flues, drainage systems, soffits, other penetrations and attachments, such as landings, ramps, stairwells, fire exits, steps, porches, decks, walkways, entrances, safety barriers (bollards), walkways and insulation.

(2) PPC shall properly maintain the exterior walls and foundations of the Infrastructure Facility to ensure that the exterior walls and foundations:

(a) Function and operate safely and perform in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the exterior walls and foundation of the Infrastructure Facility to ensure that:

(a) The foundation is structurally sound, and free of Defects affecting performance of the foundation or safety;

(b) There is no subsistence or differential settlement of the foundation;

(c) The exterior walls and foundation are weather tight with continuity of material across the entire surface;

(d) The exterior walls, attachments and the foundation are free from hazardous materials, cracks, deflections, rust, corrosion, damage, distortion or displacement;

(e) The exterior walls are free from leaks and dampness penetration and mold;

(f) The exterior walls are uniform in color and pattern;

(g) All structural components of the exterior walls are structurally sound and securely fastened;

(h) All joints and penetrations to the exterior walls and foundations are properly sealed, weather tight and performing in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(i) Chimney stacks and flues are structurally sound and secure and the flue is free from blockages and excess soot;

(j) Drainage systems are free flowing, with no blockages;

(k) Exhaust and supply vents are free of any blockages; and

(l) Attachments to the exterior walls and foundations shall be structurally sound, securely fastened and functioning in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements.

(4) PPC shall regularly inspect all exterior walls in accordance with PPC's Maintenance Plan. All repairs and renewals of the exterior walls and foundation performed by PPC shall meet these IFM Specifications and otherwise in accordance with the Technical Requirements and all Applicable Laws and Standards.

C.7.4. Exterior Doors

(1) Exterior doors includes all entrances, including steel, aluminum or wood doors and frames, overhead and coiling doors, automatic entrances, door tracks and jambs, air vents, other ventilation outlets, glass, kick plates and finishes, as well as all door hardware components, including, hinges, locks, catches, door closers and handles, weather stripping, electronic hardware parts and strikes and all overhead door opening equipment, controls and wiring.

(2) PPC shall properly maintain the exterior doors to ensure that the exterior doors:

(a) Function and operate safely and perform in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the exterior doors to ensure that:

(a) The exterior doors are weather tight;

(b) The exterior doors are free of Defects affecting performance, safety and security;

(c) The exterior doors are intact, properly fitted, open and close freely without scraping or binding and latch securely and seal tightly when closed;

(d) Door finishes are uniform in color and free from peeling, scratches, chips or other similar damage.

(e) Door tracks, doorjambs and all door hardware items including hinges, locks, closers, catches and handles are securely fastened and operate without binding, rubbing or catching in any way;

(f) Air vents, grills and other ventilation outlets are not blocked;

(g) Exterior door glass is complete and free of cracks, chips or other damage;

(h) All hardware and other attachments are fastened securely with no loose or missing parts and glass and, where applicable, are free of cracks or broken pieces; and

(i) The exterior doors are secure, with the door security system fully operational at all times.

(4) Any damage to an exterior door that prevents the Infrastructure Facility from being secured is deemed to be a Priority 1 Failure. Temporary Repairs in accordance with the Agreement that ensure adequate security of the Infrastructure Facility will not be unreasonably refused by City.

(5) PPC shall regularly inspect all exterior doors in accordance with the Maintenance Plan. PPC shall perform all repairs and renewals of the exterior doors to meet these Technical Requirements, all applicable Laws and the relevant Standards and Guidelines.

C.7.5. Exterior Windows

(1) Exterior windows include standard and specialized windows, curtain wall windows and entrance windows including glazing, seals, frames, tracks, ledges and finishes as well as motorized window blinds supplied by PPC.

(2) PPC shall properly maintain the exterior windows of the Infrastructure Facility to ensure that the exterior windows:

(a) Function and operate safely and perform in accordance with these Technical Requirements;

(b) Meet all applicable Laws and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the exterior windows to ensure that:

(a) The exterior windows operate to manufacturers' specifications;

(b) The exterior windows are safe and are free of Defects affecting performance and security;

(c) The exterior windows are intact and properly fitted and sealed;

(d) The exterior windows are weather tight and free of condensation;

(e) The exterior windows, frames, tracks and ledges are securely fastened and free from cracks, breaks, thermal seal failures or other impairments;

(f) All movable components operate freely and easily with no loose or missing parts;

(g) Where applicable, exterior windows open and close without binding; and

(h) Exterior windows and components are uniform in color and free from corroded or cracked finishes or cracked, broken or twisted frames.

(4) PPC shall maintain motorized window blinds to ensure they:

(a) Are complete and securely fixed;

(b) Are free of noticeable sagging;

(c) Are properly fitted providing complete coverage;

(d) Open and close properly;

(e) Meet the manufacturer's performance requirements; and

(f) Are free from tears, holes or other similar damage

(5) Any exterior window that is broken (beyond cracking or chipping) shall be deemed to be a Priority 1 Failure. Temporary Repairs in accordance with the Agreement that ensure adequate security of the Infrastructure Facility will not be unreasonably refused by the City.

(6) PPC shall regularly inspect all exterior windows and motorized window blinds in accordance with the Maintenance Plan. PPC shall perform all repairs and renewals of the exterior windows and motorized window blinds to meet these IFM Specifications and otherwise in accordance with the Technical Requirements, all Applicable Laws and Standards.

C.7.6. Infrastructure Facility Interior

(1) The Infrastructure Facility interior includes ceilings, walls, floors and floor coverings, fixtures and fittings, doors, windows and finishes.

C.7.7. Ceilings

(1) Ceilings include all ceiling materials and components, including, acoustic tile, gypsum board or metal linear ceiling surfaces and all structural support frames and components.

(2) PPC shall properly maintain the ceilings to ensure that the ceilings:

(a) Function and operate safely and perform in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the ceilings to ensure that:

(a) The ceilings are intact, properly fitted and sealed, and are structurally sound and secure;

(b) The ceilings are complete and level, with a uniform and even surface;

(c) Ceiling joints are flush with no loose, missing or broken pieces or components;

(d) The ceilings have no noticeable cracks, damaged finishes, deflections, water marks, staining or damp surfaces;

(e) The ceilings are free from mold, asbestos and other hazardous materials;

(f) The ceilings are uniform in color and pattern with finishes continuous over the surface; and

(g) The ceilings are free of any impairment which would pose a safety hazard.

(4) PPC shall regularly inspect all ceilings in accordance with PPC's Maintenance Plan. PPC shall perform all repairs and renewals of the ceilings to meet these Technical Requirements, all applicable Laws and the relevant Standards and Guidelines.

C.7.8. Interior Walls and Partitions

(1) Interior walls and partitions include all interior walls, partitions, components and finishes and all supporting elements.

(2) PPC shall properly maintain the interior walls and partitions to ensure that the interior walls and partitions:

(a) Function and operate safely and perform in accordance with these Technical Requirements;

(b) Meet all applicable Laws and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the interior walls and partitions to ensure that:

(a) The interior walls are structurally sound and safe;

(b) The interior walls are adequately protected, uniform and have an even surface;

(c) The interior walls are free from asbestos and other hazardous materials;

(d) The interior walls and partitions have continuity of material across its entire surface;

(e) The interior walls and partitions are free from cracks, deflections, damage, distortion or displacement;

(f) The interior walls and partitions are free from dampness and mold;

(g) Finishes and coverings are complete, uniform in color and pattern and are free from peeling, rips, tears or discoloration.

(h) Ventilation penetrations are not blocked;

(i) The interior wall tiling and backsplashes are water tight and free of chipping or lifting; and

(j) The interior wall penetrations, including ventilation grills, are securely fastened.

(4) PPC shall regularly inspect all interior walls and partitions in accordance with the Maintenance Plan. PPC shall perform all repairs and renewals of the interior walls and partitions to meet these Technical Requirements, all Applicable Laws and Standards.

C.7.9. Floors

(1) Floors include hard floors including ceramic tile, terrazzo, concrete and wood flooring, resilient flooring, recessed entry mats and all soft or carpeted floors.

(2) PPC shall properly maintain the floors to ensure that the floors:

(a) Function and operate safely and perform in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the floors to ensure that:

(a) The floors are structurally sound, intact and properly fitted;

(b) The floors are fully supported at all bearing points;

(c) The floors are water tight with no damp spots;

(d) The floors have no subsidence or differential settlement;

(e) The floors and support systems are free of holes, tears, scoring, cracks, breaks, uneven surfaces, heaving or other impairments;

(f) The floors do not creak or squeak;

(g) Floor coverings are to be fully adhered to the floor, do not pose any tripping or other safety hazard and are uniform in color and pattern.

(h) Flooring does not bubble, blister or stretch;

(i) There is no lifting, tears or cracking at joints or corners;

(j) Repairs, patches and replacements shall match the color and pattern of existing floor coverings;

(k) Recessed entry mat frames are properly fitted with no tripping hazards or loose parts; and

(l) Recessed entry mats are functioning as intended, without material deterioration or wearing.

(4) PPC shall regularly inspect all floors and floor coverings in accordance with the Maintenance Plan. PPC shall perform all repairs and renewals of the floors and floor coverings to meet these IFM Specifications and otherwise in accordance with the Technical Requirements, all Applicable Laws and Standards.

C.7.10. Fixtures, Fittings, Millwork and Equipment

(1) Fixtures, fittings, millwork and equipment include all fixed in place millwork such as overhead cabinets, cupboards, counters, storage cabinets, bookcases as well as the doors, drawers and shelving and related hardware, bathroom, toilet and change / locker room partitions, lockers and benches.

(2) PPC shall properly maintain the fixtures, fittings, millwork and equipment to ensure that the fixtures, fittings, millwork and equipment:

(a) Function and operate safely and perform in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the fixtures, fittings, millwork and equipment to ensure that:

(a) Fixtures, fittings and millwork are intact with no missing or damaged parts;

(b) Equipment is fully operational, with no missing or damaged parts;

(c) Fixtures, fittings, millwork and equipment are properly secured, fastened and fitted;

(d) All finishes and countertop surfaces are firmly attached and free from discoloration or broken pieces;

(e) Cabinet doors and drawers open and close freely;

(f) Cabinet hardware operates smoothly with no missing parts;

(g) Washroom and change / locker room partitions, doors and lockers are securely fastened;

(h) Washroom and change / locker room partition, door and locker finishes are free from peeling and uniform in color;

(i) Washroom and change / locker room doors and locker doors swing freely, closing and locking without binding;

(j) Equipment performs to manufacturers' specifications;

(k) Interior signage provided by PPC is legible and securely fastened in place; and minimum repair or replacement size is one matching length, sheet or single component.

(l) PPC shall regularly inspect the fixtures, fittings, millwork and equipment in accordance with the Maintenance Plan. Equipment shall be maintained in accordance with manufacturers' specifications. PPC shall perform all repairs and renewals of the fixtures, fittings, millwork and equipment to meet these IFM Specifications and otherwise in accordance with the Technical Requirements, all Applicable Laws and Standards.

C.7.11. Interior Doors

(1) Interior doors include hollow metal, steel and solid or hollow wood core doors, and all associated hardware and components such as door frames, tracks and jambs, hinges, locks, catches, closers, handles and glass, where applicable.

(2) PPC shall properly maintain the interior doors to ensure that the interior doors:

(a) function and operate safely and performs in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements,

(b) meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) meet the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the interior doors to ensure that:

(a) the interior doors are free of Defects affecting performance, safety and security;

(b) the interior doors are intact, properly fitted, open and close freely, without scraping or binding and shall latch securely when closed;

(c) door finishes are uniform in color and free from peeling, scratches, chips or other similar damage.

(d) door tracks, doorjambs and all door hardware items including hinges, locks, closers, catches and handles are securely fastened and operate without making noise or binding, rubbing or catching in any way;

(e) air vents, grills and other ventilation outlets are not blocked;

(f) interior door glass is complete and free of cracks, chips or other damage;

(g) all hardware and other attachments are fastened securely with no loose or missing parts and glass and, where applicable, are free of cracks or broken pieces; and

(h) minimum repair or replacement size is one matching length, sheet or single component.

(4) PPC shall regularly inspect all interior doors in accordance with the Maintenance Plan. PPC shall perform all repairs and renewals of the interior doors to meet these IFM Specifications and otherwise in accordance with the Technical Requirements, all Applicable Laws and Standards.

C.7.12. Interior Windows

(1) Interior windows include standard and specialized windows, interior wall windows and entrance windows including all frames, tracks, coverings and ledges that form part of the interior window.

(2) PPC shall properly maintain the interior windows to ensure that the interior windows:

(a) Function and operate safely and performs in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements.

(b) Meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the interior windows to ensure that:

(a) The interior windows operate to manufacturers' specifications;

(b) The interior windows are safe and are free of Defects affecting performance;

(c) The interior windows are intact and properly fitted and sealed;

(d) The interior windows, frames, tracks and ledges are securely fastened and free from cracks, breaks, missing parts, broken parts or other impairments;

(e) All movable components, where applicable, are secure and operate freely and easily with no loose or missing parts; and

(f) The interior windows and components are safe and in good operating condition with no broken or cracked glass or other missing or broken parts.

(4) PPC shall regularly inspect all interior windows of the Infrastructure Facility in accordance with the Maintenance Plan. PPC shall perform all repairs and renewals of the interior windows shall meet these IFM Specifications and otherwise in accordance with the Technical Requirements, all Applicable Laws and Standards.

C.7.13. Infrastructure Facility Systems

(1) Infrastructure Facility systems include the plumbing system, heating and ventilation system and air conditioning, electrical system, communication system, fire prevention equipment, fire alarm system and elevators.

C.7.13.1. Plumbing System

(1) The plumbing system includes:

(a) Domestic hot and cold water service including piping system, hot water heater, recirculation pumps and piping and branch piping, non-freeze hose bibbs, supply and drainage lines;

(b) Sanitary sewer including piping, traps or interceptors, drainage lines; and

(c) Plumbing fixtures including toilets, urinals, flush valves, faucets, sinks, non-refrigerated drinking fountains, shower fixtures.

(2) PPC shall properly maintain the plumbing system to ensure that the plumbing system:

(a) Functions and operates safely and performs in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meets all applicable Laws and Regulatory Approvals; and

(c) Meets the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the plumbing system to ensure that:

(a) A constant supply of hot and cold water is produced for sinks, toilets and urinals on demand;

(b) Domestic hot water must be generated and distributed at temperatures in accordance with the Technical Requirements;

(c) Piping insulation is intact and free from dampness or deterioration to ensure no heat loss;

(d) Piping and the parts and components thereof are securely fastened;

(e) Piping and the parts and components thereof are free of all drips or leaks;

(f) Taps, valves and other related parts and fittings function and operate in accordance with IFM Specifications and otherwise in accordance with the these Technical Requirements;

(g) All fixtures, including toilets, urinals, sinks and drinking fountains, showers, etc. are securely fastened, free of all drips or leaks, with all moving parts including taps, flush valves, drain stoppers and water fountains operating freely and easily;

(h) All sanitary sewer pipes, drainage traps and interceptors are free flowing and unblocked;

(i) The sanitary sewer system provides safe conveyance of sewage or waste to the disposal system and contains the odours produced; and

(j) The plumbing system operates with minimal noise and prevents the transmission of discernable vibration into office areas.

(4) PPC shall regularly inspect the plumbing system in accordance with the Maintenance Plan. PPC shall perform all repairs and renewals of the plumbing system to meet these IFM Specifications and otherwise in accordance with the Technical Requirements, all Applicable Laws and Standards.

C.7.13.2. Heating and Ventilation System and Air Conditioning

(1) The heating and ventilation and air conditioning system includes all equipment and components relating to such system including chillers, HVAC units, boilers, compressors, furnaces, pumps, motors, controls, duct work, vents, mixing boxes and dampers relating to the delivery of heating, cooling, ventilation, air and humidity to the Infrastructure Facility. The heating and ventilation system also includes the BAS.

(2) PPC shall properly maintain the heating and ventilation system and the air conditioning to ensure that the heating and ventilation system and the air conditioning at the Infrastructure Facility:

(a) Functions and operates safely and performs in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meets all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meets the Handback Requirements at the end of the Term.

(3) In addition, PPC shall maintain the heating, cooling and ventilation system to ensure that:

(a) The heating, cooling and ventilation system operates to prevent the transmission of discernable vibration into office areas;

(b) All equipment, parts and components are securely fastened and functioning according to these IFM Specifications and otherwise in accordance with the Technical Requirements to ensure energy efficiency;

(c) The heating, cooling and ventilation system meet the performance requirements set out in the Technical Requirements;

(d) Humidity, temperature, air flow, air exchange and IAQ is maintained such that it meets the performance requirements set out in the Technical Requirements and otherwise in accordance with the Performance Requirements;

(e) All duct work and controls functions without air leakage;

(f) Piping and equipment operates with no missing parts;

(g) Piping and equipment is free of leaks, rust or corrosion;

(h) Where applicable, insulation is intact and free of damage or holes;

(i) Filtration media is maintained and replaced as necessary to maintain indoor air quality and the efficient operation of the heating and ventilation system;

(j) The BAS is maintained to ensure optimum operation of the heating, cooling and ventilation system and electrical system, including:

i. resetting the air and water supply temperatures;

ii. resetting the humidity from outside air; and

iii. controlling the lighting and car plugs;

(k) The BAS operates in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements and initiates the appropriate alarms as required.

(4) PPC shall regularly inspect, test, verify and calibrate the heating, ventilation system, air conditioning and BAS in accordance with the Maintenance Plan. PPC shall perform all repairs and renewals of the heating and ventilation system, air conditioning and BAS to meet these IFM Specifications and otherwise in accordance with the Technical Requirements, all Applicable Laws and Standards.

C.7.14. Electrical System

(1) The electrical system includes interior lighting, exterior lighting and the components described as “Electrical – Other” below.

C.7.14.1. Interior and Exterior Lighting

(1) Interior and exterior lighting includes all light fixtures, lamps, tubes, luminaires, ballasts, room lighting controls, light poles and emergency and exit lighting.

(2) PPC shall properly maintain the interior and exterior lighting to ensure that the interior and exterior lighting:

(a) Functions and operates safely and performs in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meets all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meets the Handback Requirements at the end of the Term.

(3) PPC shall maintain the interior lighting to ensure that:

(a) Interior lighting is fully functional and safe;

(b) Interior lighting meets the lux levels set out in the Technical Requirements;

(c) Flickering or burned out lamps or tubes are replaced;

(d) Lamps and tubes operate with no sign of visual deterioration;

(e) Interior light fixtures are kept securely fastened and free from tarnishing, cracks, chips, peeling or other similar damage;

(f) All shades, light switches and controls are free of cracks, breakage, chips or similar damage;

(g) Lighting controls operate in accordance with manufacturers' specifications and in accordance with IFM Specifications and otherwise in accordance with the Technical Requirements;

(h) Emergency and exit lighting is kept fully charged and operational at all times;

(i) Emergency and exit lighting meets the requirements of the applicable legislative requirements;

(j) All other interior lighting parts and components meet all Applicable Law and Standards; and

(k) Interior lighting does not create a fire hazard.

(4) In addition, PPC shall maintain the exterior lighting to ensure that:

(a) Exterior lighting is fully functional and safe;

(b) Exterior lamps and tubes are replaced when flickering or burned out;

(c) Exterior light fixtures and poles are maintained in good operating condition;

(d) Exterior light fixtures are kept clean and in good repair with no visible corrosion, peeling or discoloration;

(e) Exterior light fixtures have no missing or broken parts;

(f) Exterior light fixtures and poles are structurally sound and operate safely;

(g) Exterior light poles shall be maintained plumb within 0.5 inches in 3.5 feet;

(h) Exterior light covers shall be secure and free from cracks, broken or missing parts or discoloration; and

(i) Exterior lighting does not create a fire hazard.

(5) PPC shall regularly inspect and test the interior and exterior lighting in accordance with the Maintenance Plan. PPC shall perform all repairs and renewals of interior and exterior lighting shall meet these IFM Specifications and otherwise in accordance with the Technical Requirements, all Applicable Laws and Standards.

C.7.14.2. Electrical – Other

(1) "Electrical – Other" includes the electrical distribution system, transformers, switchgear, switchboards and panel boards, electrical distribution panels and controls, feeders, circuit breakers, electrical outlets and receptacles, car plugs and posts, conduit, raceway and wiring. "Electrical – Other" also includes the emergency lighting system.

(2) PPC shall properly maintain the components of "Electrical – Other" to ensure that the components of "Electrical – Other":

(a) Functions and operates safely and performs in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meets all Applicable Laws and Standards Regulatory Approvals; and

(c) Meets the Handback Requirements at the end of the Term.

(3) PPC shall maintain the components of "Electrical – Other" to ensure that:

(a) The power distribution system constantly supplies power to the Infrastructure Facility;

(b) The power distribution system provides a safe and sufficient power supply in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(c) The power distribution system functions as designed, without undue noise or vibration;

(d) The main distribution system equipment and components is fully operational and free of Defects that affect proper operation of the system;

(e) All raceways, conduit, boxes, wiring, fittings, fixtures, controls and safety devices are fully operational, securely fastened to their intended point of anchorage and labeled in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(f) All electrical outlets and receptacles shall be operational with no broken, missing or loose parts;

(g) The emergency lighting system is operational and functioning in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements.

(4) The components of "Electrical – Other" shall be regularly inspected and tested in accordance with the Maintenance Plan. All repairs and renewals of the components of "Electrical – Other" shall meet these IFM Specifications and otherwise in accordance with the Technical Requirements, all applicable Laws and Standards.

C.7.14.3. Communications Systems

(1) Communication systems include the security system, clock system, parking controls as well as all ICT conduit and raceways required to be provided by PPC pursuant to these IFM Specifications and otherwise in accordance with the Technical Requirements.

(2) PPC shall properly maintain the communication systems to ensure that the communication systems:

(a) Function and operate safely and perform in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(3) PPC shall maintain the communication systems to ensure that:

(a) All systems operate and perform in accordance with the manufacturers' specifications, recommendations, and these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) The security system is fully operational and initiates alarms in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements; and

(c) ICT conduit and raceways shall be intact, functional and securely fastened at all times.

(4) PPC shall regularly inspect and test the systems in accordance with the Maintenance Plan. PPC shall perform all repairs and renewals of any communication system to meet these IFM Specifications and otherwise in accordance with the Technical Requirements, all Applicable Laws and Standards.

C.7.15. Fire Prevention Equipment and Fire Alarm System

(1) Fire prevention equipment includes all fire safety systems and equipment, such as fire sprinklers, standpipe and hose networks, and fire extinguishers (including carbon dioxide, wet chemical, dry chemical, clean agent and foam extinguishers).

(2) The fire alarm system includes the fire alarm system control panel, heat and smoke detectors, pull stations, alarms, annunciators and all associated wiring and equipment.

(3) PPC shall properly maintain the fire prevention equipment and fire alarm system to ensure that the fire prevention equipment and fire alarm system:

(a) Function and operate safely and perform in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meet all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meet the Handback Requirements at the end of the Term.

(4) PPC shall maintain the fire prevention equipment and fire alarm system to ensure that:

(a) The fire prevention equipment and fire alarm system are fully functional and operating as designed;

(b) Fire prevention equipment and fire alarm system are maintained, repaired and updated, as required, to ensure it is in compliance with these IFM Specifications and otherwise in accordance with the Technical Requirements and all Applicable Laws and Standards;

(c) Sprinkler systems and components shall be free of leaks and damage, with all parts functioning and operational in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements; and

(d) Fire extinguishers and other firefighting equipment are maintained in accordance with all Applicable Law and Standards.

(5) Suitable systems and procedures shall be established and maintained by PPC to ensure that all fire prevention equipment is examined and tested, with the records of all such tests and the dates thereof prepared in an accurate and sufficiently detailed manner. PPC shall ensure that the fire protection equipment and fire alarm system is regularly monitored in accordance with the Maintenance Plan and tested in accordance with all Applicable Laws and Standards and Regulatory Approvals.

C.7.16. Elevators

(1) Elevators include the elevator cab, cabling, telephone, indicator lights, call buttons, door openers, controllers, pit drains, and all parts and components thereof.

(2) PPC shall properly maintain the elevators to ensure that the elevator:

(a) Functions and operates safely and performs in accordance with these IFM Specifications and otherwise in accordance with the Technical Requirements;

(b) Meets all Applicable Laws and Standards and Regulatory Approvals; and

(c) Meets the Handback Requirements at the end of the Term.

(3) PPC shall maintain the elevator to ensure that:

(a) The elevator is operational and available for use;

(b) The elevator car moves smoothly;

(c) The elevator car levels properly at each floor, without tripping hazards;

(d) The doors opening smoothly without binding;

(e) All elevator safety devices function properly;

(f) All parts and components, including indicator lights, call buttons, emergency telephone, door openers and controllers and performance such as speed operate in accordance with these Technical Requirements; and

(g) The elevator door and passenger compartment finishes must be free from peeling or discoloration and, where applicable, paneling must be securely fastened.

(4) PPC shall ensure that the elevator is regularly maintained by qualified personnel. PPC shall ensure that the elevator shall be inspected annually in accordance with applicable Laws and Regulatory Approvals.

(5) PPC shall immediately respond to all elevator alarms or telephone calls from an elevator and immediately initiate the required action to release trapped individuals.

(6) In the event of failure in the operation of the elevator, trapped individuals must be released from the elevator as soon as practicable but in any event no later than one hour from notification.

Section D - Ad Hoc Services

(1) PPC shall provide Ad-Hoc Services on an as-requested and non-exclusive, fee for services basis. City has the right to procure services from alternate suppliers. Where City procures and manages the services, PPC may be responsible for coordination, reviewing plans, etc.

(2) Fees for services provided shall be provided at market rates with only an agreed mark-up for Ad-Hoc services.

(3) All Ad-Hoc Services must be pre-authorized in accordance with agreed procedures and policy. PPC shall not be compensated for costs incurred where work is performed without pre- authorization.

(4) Ad Hoc Services will be initiated through the Help Desk by authorized City Representatives. Where requests are received from non-authorized individuals, PPC will advise the individuals to follow the established procedures.

(5) PPC shall work with City to ensure the scope, definition of requirements, schedule and budgets, where applicable, are established prior to proceeding with the work.

(6) If the request has an impact on the Infrastructure Facility or the IFM Project Site, PPC shall advise City of the impact and where necessary, Article 12 (City Change Process, Unilateral Change Orders, Deviation) of the Agreement will apply.

(7) The fees for work performed as Ad-Hoc Services shall be included in the monthly invoice to City with a separate itemization and back-up documentation as agreed with City.

(8) The Ad-Hoc Services includes the following services.

(a) Installation, relocation or removal of pictures, white boards or other similar items attached to the walls.

(b) Set-up, reconfiguration and arrangement of furniture and modular units as necessary.

(c) Minor moves, including reconfiguration or setup of furniture, moving and related infrastructure such as cabling and power provision.

(d) Minor furniture repairs.

(e) Support for and/or installation of audio visual or telecommunications or equipment.

(f) Key cutting and removing broken keys from locks.

(9) Additional services may be requested by City and provided at the option of PPC.

Section E - Renewal Work

E.1 General Requirements

(1) The objective of the Renewal Work is to ensure the long-term integrity and ongoing operational serviceability of the Infrastructure Facility through the delivery of the Renewal Work Plan which defines design life, specific replacement/refurbishment strategies.

(2) PPC shall deliver Renewal Work to maintain the standards of the Infrastructure Facility in accordance with the approved Renewal Work Plan and result in an asset condition and Residual Life in accordance with Handback Requirements.

(1) All standards for replacement or refurbishment as a result of the Renewal shall be in accordance with the Technical Requirements. Where replacements are not available to the required standards, they may be substituted with similar equivalent or higher standard materials or equipment. Substitutions must be fully documented, and equivalence demonstrated to the satisfaction of City.

E.2 Renewal Work Plans and Reports

(1) PPC shall:

(a) Provide an initial 30-year Renewal Work Plan prior to Substantial Completion identifying the renewal projects planned in each Contract Year. The Renewal Work Plan shall be provided in spreadsheet format with assets identified to the Uniformat II level 3 or equivalent detail by row. For each row, the columns shall indicate the estimated design life with additional columns for each year of the Operating period and the estimated cost for the Renewal Work for each asset in the respective year it is planned. The source may be a software solution however the information must also be provided to the City in spreadsheet format. City and PPC shall agree upon acceptable format of Renewal Work Plan at least 6 months prior to Substantial Completion.

(b) Provide a revised Renewal Work Plan to the end of the IFM Period annually as part of the Annual Service Plan, reflecting any changes to the planned projects

(c) Provide a Renewal Work schedule for each subsequent Contract Year at least 3 months prior to the commencement of the Contract Year. The s should identify the projects scheduled for that Contract Year, the planned start and completion dates and potential impacts on SFMTA O&M Services. Where schedules have a potential impact on SFMTA O&M Services, City may require PPC to change their schedule and/or provide a plan to demonstrate mitigation of impact or risk to SFMTA O&M Services.

(d) Provide a summary of Renewal Work completed or in progress as part of the Annual Service Plan.

(e) Provide a summary and status of completed, in progress, and upcoming work in the monthly management reports and meetings.

E.3 Commissioning

(1) PPC shall commission or re-commission components or systems as required following any Renewal Work activity which may impact operational efficiency or effectiveness of the system or component.

E.4 Facility & System Condition Index

(1) PPC shall prepare and submit to City every five (5) years a Facility Condition Index ("FCI") and System Condition Index ("SCI"). The FCI and SCI will be no more than 0.15, unless approved by City and only based on appropriate justification provided by PPC for the deviation and confirmation that the Handback Requirements will be met. The FCI and SCI will be measured and calculated by a third party and be included in the report prepared for the Joint Technical Review.

(2) The FCI shall be calculated in accordance with accepted industry practice by dividing the maintenance, repair, and replacement of the Infrastructure Facility by the current replacement value of the Infrastructure Facility.

Section F - Handback Requirements

F.1 Handback Services

F.1.1. General Requirements

(1) Not earlier than 365 days and not later than 90 days prior to the end of the Term, PPC shall perform and deliver all of the requirements as detailed in this section.

(2) PPC shall assign a Move-In Manager and attend Move-In meetings as needed by City to ensure transfer of knowledge and information from PPC to City or City's designated entity.

(3) PPC shall provide training to personnel who may replace PPC personnel. This will include job shadowing and an overlap period of at least two weeks.

(4) All data and information used in the administration and management of the Infrastructure Facility shall be turned over to City in non-proprietary formats and where systems are currently in use, provide City with an opportunity to licence, or take over the licence, of those systems.

F.1.2. Handback Requirements

(1) At the end of the Term, the PPC shall, at no cost to the City, surrender the Infrastructure Facility to the City in a condition that is as follows:

(a) The Infrastructure Facility will be in a condition so that each Maintained Element has a Residual Life of not less than indicated in Appendix C of this Exhibit 18 (Technical Requirements).

(b) The performance of the asset shall be at a level commensurate with the performance to be expected from a Well-Maintained Asset and in accordance with the findings and recommendations following the last Joint Technical Review performed. For the purposes of this article a Well-Maintained Asset is defined as an asset that has received regular and demonstrable routine service and Scheduled Maintenance as prescribed by the supplier, manufacturer and/or installer of the asset and whose age-driven performance degradation is no greater than that identified in open-source data published by the supplier, manufacturer and/or installer.

(c) Designed and constructed in accordance with the applicable requirements in the Project's Technical Requirements.

(d) Managed and maintained in accordance with the applicable requirements set forth in this IFM Specification and the Technical Requirements.

(e) Required to achieve an FCI score of 0.10 or less at the end of the IFM Period and as determined by the Handback Requirements defined in this Section.

(2) At the end of the Term, the PPC shall provide and leave on site the following supplies of spare parts and consumables:

(a) A 12 month supply of spare parts based on an analysis of emergency /critical spare part requirements that includes long lead time or specialty items as necessary to ensure reliability and continuous function as well as other spare parts based on the historical consumption of all spare parts.

(b) A 12 month supply of consumables for maintenance and repair requirements based on historical consumption.

(c) A one month supply of consumables for cleaning, landscaping, pest control and any other non-maintenance and repair services.

(d) PPC shall provide an electronic inventory of spare parts and an electronic inventory of consumables with the supply/part description, manufacturer, part number, quantity, location and the supplier.

F.2 Handback

(1) PPC shall comply with Section 8.6 of the Agreement with respect to Handback. The Handback Survey may be combined with a Joint Technical Review (JTR) as appropriate depending on timing and in the sole discretion of the City.

(2) If either the PPC or the City determines from the Handback Inspection that any element of the Infrastructure Facility will not meet the Handback Requirements through the PPC implementing the established Maintenance Plan over the remainder of the IFM Period, within 60 days of completion of the Handback Inspection the PPC will submit to the City the PPC's plan (i.e., a "Handback Requirements Recovery Plan") to perform additional work needed to meet the Handback Requirements at the end of the IFM Period (the "Handback Requirement Recovery Work"). Such a plan will include a schedule and cost estimates for the Handback Requirements Recovery Work, which will be the sole responsibility of the PPC under the terms of the Project Agreement.

(3) The City may review and comment on the Handback Requirements Recovery Plan. Such review includes the adequacy of the Handback Requirements Recovery Work and reasonableness of the PPC's schedule and cost for the proposed Handback Requirements Recovery Plan implementation.

Section G - Performance Measurements

REF.	Service	Measure	LEVEL	Response	Rectification	FREQ.	Points	Penalty
Sect.B	General Management Services Management and Administration	PPC to provide administrative and management services in accordance with these IFM Specifications	MED	N/A	N/A	Per Failure Event	5	$300
B.8.1.2	General Management Services Management and Administration	IFM Manager (or designate) provided by PPC for the Infrastructure Facility available and contactable 24 hours, 365(6) days/year	MAJOR	N/A	N/A	Per Calendar Day	10	$650
B.17	General Management Services Management and Administration	PPC shall at all times have in place the Performance Monitoring Program for all of the IFM Services in accordance with these IFM Specifications	MAJOR	N/A	N/A	Per Calendar Day	10	$650
B.8.1.6	General Management Services Management and Administration	All PPC employees and Contractor employees have received orientation training prior to starting work.	MED	N/A	N/A	Per Calendar Day	5	$300

REF.	Service	Measure	LEVEL	Response	Rectification	FREQ.	Points	Penalty
Sect.B	General Management Services Management and Administration	All PPC employees are appropriately trained, and records maintained in accordance with these IFM Specifications	MED	N/A	N/A	Per Contract Month	5	$300
B.8.1.2	General Management Services Management and Administration	Proof of licenses, qualifications and registrations provided to City Representative for all PPC Staff annually.	MAJOR	N/A	N/A	Per Failure Event	10	$650
B.18	General Management Services Management and Administration	Compliance with all Applicable Law and Standards.	MAJOR	N/A	N/A	Per Failure Event	10	$650
B.8.1.6	General Management Services Reporting	Prepare, submit and update Service Reports in accordance with these IFM Specifications.	MED	N/A	N/A	Per Failure Event	5	$300
B.8.1.5	General Management Services Reporting	Prepare, submit and update Performance Monitoring Report in accordance with these IFM Specifications.	MAJOR	N/A	N/A	Per Contract Month	10	$650
B.14 (4)	General Management Services Reporting	The status on all statutory testing is reported to City on a monthly basis or as per applicable Law.	MAJOR	N/A	N/A	Per Contract Month	10	$650

REF.	Service	Measure	LEVEL	Response	Rectification	FREQ.	Points	Penalty
B.3	General Management Services IFM Services Procedures & Documentation	Prepare, submit and update all IFM Services Procedures in accordance with these IFM Specifications	MED	N/A	N/A	Per Failure Event	5	$300
B.10	General Management Services IFM Services Procedures & Documentation	Prepare, submit and update the IFM Services Procedures.	MAJOR	N/A	N/A	Per Failure Event	10	$650
B.18	General Management Services IFM Services Procedures & Documentation	Prepare, submit and update 5-Year and detailed 1 Year Scheduled Maintenance Plans in accordance with these IFM Specifications	MAJOR	N/A	N/A	Per Non	10	$650
B.3	General Management Services IFM Services Procedures & Documentation	Prepare, submit and update Renewal Work Plans in accordance with these IFM Specifications.	MAJORx2	N/A	N/A	Per Non	20	$1300
B.6	General Management Services IFM Services Procedures & Documentation	Maintain appropriate records in relation to all PPC permits, licenses and approvals.	MAJORx2	N/A	N/A	Per Failure Event	20	$1300

REF.	Service	Measure	LEVEL	Response	Rectification	FREQ.	Points	Penalty
B.6.1(4)	General Management Services IFM Services Procedures & Documentation	Update all As-Built drawings in accordance with these IFM Specifications	MAJORx2	N/A	N/A	Per Failure Event	20	$1300
C.6.7.1 C.6.7.2	Move-In Services	Provision of Move-In In Services in accordance with these IFM Specifications	MED	N/A	N/A	Per Failure Event	5	$300
E.2	Move-In Services	Prepare, submit and update Move-In Plan in accordance with these IFM Specifications	MAJORx2	N/A	N/A	Once	20	$1300
B.3	Move-In Services	Staff involved in Move-In in accordance with these IFM Specifications	MEDx2	N/A	N/A	Per Failure Event	10	$600
C.6.1	Help Desk Services	Help Desk Services provided in accordance with these IFM Specifications.	MEDx2	N/A	N/A	Per Calendar Day	10	$600
B.25	Help Desk Services	Service Requests and transactions are categorized and recorded in accordance with these IFM Specifications	MAJORx2	N/A	N/A	Per Failure Event	20	$1300
B.25.1(3)	Help Desk Services	The Help Desk Service (by phone and web) is available 24 hours per day, 365(6) days per year.	MAJORx2	N/A	N/A	Per Calendar Day	20	$1300

REF.	Service	Measure	LEVEL	Response	Rectification	FREQ.	Points	Penalty
B.25.1(1)	Utilities Management Services	Utilities Management Services are delivered in accordance with these IFM Specifications	MED	N/A	N/A	Per Failure Event	5	$300
B.19	Utilities Management Services	Monthly Utility Analysis conducted in accordance with these specifications.	MAJORx2	N/A	N/A	Per Contract Month	20	$1300
B.19.2(2)	Environmental Management Services	Environmental Management Services are delivered in accordance with these IFM Specifications	MED	N/A	N/A	Per Failure Event	5	$300
B.19.20	Environmental Management Services	PPC shall put programs in place to ensure monitoring, inspection, testing, handling, storage and clean up as required for all elements of the EMS.	MEDx2	N/A	N/A	Per Calendar Day	10	$600
B.21	Environmental Management Services	No environmental releases, spills or noncompliance.	MAJOR	N/A	N/A	Per Event	10	$650
B.21	Environmental Management Services	Prepare, submit and update an annual environmental compliance statement	MAJORx2	N/A	N/A	Per Non	20	$1300
B.22	Environmental Management Services	Achieve LEED EBOM certification as per these IFM Specifications	MAJORx2	N/A	N/A	Per Calendar Week	20	$1300
B.22.2	Emergency Management Services	Emergency Management Services are delivered in accordance with these IFM Specifications	MEDx2	N/A	N/A	Per Failure Event	10	$600

REF.	Service	Measure	LEVEL	Response	Rectification	FREQ.	Points	Penalty
B.22	Emergency Management Services	PPC has at all times its own contingency plan in place.	MAJORx2	N/A	N/A	Per Failure Event	20	$1300
B.22.2(2)	Emergency Management Services	PPC has response and mitigation plans for emergency situations in accordance with these IFM Specifications.	MAJORx2	N/A	N/A	Per Failure Event	20	$1300
B.22.4(2)	Emergency Management Services	PPC has comprehensive fire management plan in place at all times.	MAJORx2	N/A	N/A	Per Failure Event	20	$1300
B.23	Quality & Performance Management Services	Maintain and use an IFM Management Plan to manage quality in accordance with these IFM Specifications	MEDx2	N/A	N/A	Per Calendar Day	10	$600
B.23.3.2	Quality & Performance Management Services	Conduct quality inspections in compliance with the IFM Quality Management Plan.	MAJORx2	N/A	N/A	Per Contract Quarter	20	$1300
B.23.2	Quality & Performance Management Services	Conduct occupant satisfaction surveys in accordance with these IFM Specifications	MAJORx2	N/A	N/A	Per Contract Year	20	$1300
B.23	Quality & Performance Management Services	Conduct transaction satisfaction surveys in accordance with these IFM Specifications	MAJORx2	N/A	N/A	Per Contract Quarter	20	$1300

REF.	Service	Measure	LEVEL	Response	Rectification	FREQ.	Points	Penalty
B.16	Quality & Performance Management Services	Provide action plan(s) as required by these IFM Specifications	MEDx2	N/A	N/A	Per Failure Event	10	$600
B.16(2)(f)	Quality & Performance Management Services	Implement action plan(s) as agreed between the City and PPC.	MEDx2	N/A	N/A	Per Failure Event	10	$600
B.16	Quality & Performance Management Services	% satisfaction score for each service category on the occupant satisfaction survey no more than 5% lower than the baseline.	MAJORx2	N/A	N/A	Per Contract Quarter	20	$1300
B.16	Quality & Performance Management Services	% satisfaction score for the Transaction Satisfaction Survey no more than 5% lower than the baseline.	MAJORx2	N/A	N/A	Per Contract Quarter	20	$1300
B.16.3(b)	Maintenance Services	Landscaping Services are delivered in accordance with these IFM Specifications	MED	N/A	N/A	Per Failure Event	5	$300
B.16.3(c)	Cleaning Services	Cleaning Services are delivered in accordance with these IFM Specifications.	MED	N/A	N/A	Per Failure Event	5	$300
B.16.1	Solid Waste Collection, Recycling and removal Services.	Solid Waste Collection, Recycling and Removal Services are delivered in accordance with these Specifications	MED	N/A	N/A	Per Failure Event	5	$300

REF.	Service	Measure	LEVEL	Response	Rectification	FREQ.	Points	Penalty
B.16.2	Maintenance Services	Maintenance Services are delivered in accordance with these IFM Specifications	MAJOR	N/A	N/A	Per Failure Event	10	$650
C.4	Maintenance Services	100% of regulatory requirements completed within the planned period.	MAJOR	N/A	N/A	Per Contract Month	10	$650
C.5	Maintenance Services	90% of non-regulatory Scheduled Maintenance completed within the planned period.	MAJOR	N/A	N/A	Per Contract Month	10	$650
C.2	Maintenance Services	Provision and maintenance of a CAFM System in accordance with these IFM Specifications	MAJOR	N/A	N/A	Per Calendar Day	10	$650
C.6	Maintenance Services	Commissioning of all new systems and equipment based on approved commissioning procedures.	MAJORx2	N/A	N/A	Per Failure Event	20	$1300
C.6.3	Renewal Work	Renewal Work delivered in accordance with these IFM Specifications.	MAJORx2	N/A	N/A	Per Contract Month	20	$1300
C.6.3	Response & Rectification	Priority 1 requests are Responded to within the Response Time	MAJOR	See B.18.1.2		Per Failure Event	10	$650
C.6.6	Response & Rectification	Priority 2 requests are Responded to within the Response Time	MED	See B.18.1.2		Per Failure Event	5	$300
C.6.2	Response & Rectification	Priority 3 requests are Responded to within the Response Time	MINOR	See B.18.1.2		Per Failure Event	1	$75

REF.	Service	Measure	LEVEL	Response	Rectification	FREQ.	Points	Penalty
E.1	Response & Rectification	Priority 1 requests are Rectified within the Rectification Time	MAJOR	See B.18.1.2		Per Failure Event	10	$650
B.18.1.2	Response & Rectification	Priority 2 requests are Rectified within the Rectification Time	MED	See B.18.1.2		Per Failure Event	5	$300
B.18.1.2	Response & Rectification	Priority 3 requests are Rectified within the Rectification Time	MINOR	See B.18.1.2		Per Failure Event	1	$75
B.18.1.2	Availability Failures	Availability Failures are Responded to within the Response Time	N/A	See B.18.1.3		See Exhibit 4 Payment Mechanism		
B.18.1.2	Availability Failures	Availability Failures are Rectified within the Rectification Time	N/A	See B.18.1.3		See Exhibit 4 Payment Mechanism		
[Placeholder for DBE requirements]								

Appendix A – Space Tolerances

The below document established tolerance levels whereby deviations from the Performance Requirements ('Design') established in Division 3 (Design Criteria) of Exhibit 18 (Technical Requirements), constitute Service Failures or Availability Failures, as required.

Temperature Tolerances:

For the purposes of interpreting the Table 1 – Performance Parameters for Space Temperatures below:

- A Service Failure will occur if the temperature is outside of the Performance Tolerance range. For greater clarity, a Service Failure will not occur if the temperature is within the provided range ('+/-')
- An Availability Failure will occur if the temperature is below the Availability Threshold in Winter, or exceeds the Availability Threshold in Summer
- Note that these tolerances are required during core hours only – City to agree with PPC on appropriate setback times during Commissioning.

Table 1 – Performance Parameters for Space Temperatures

Area/Item	Winter Parameters			Summer Parameters		
	Design	Performance Tolerance	Availability Threshold	Design	Performance Tolerance	Availability Threshold
1. Office Areas						
Office Areas	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
2. Parking Areas						
Parking L3 & L4	65°F			Ambient		
3. Bays & Shops						
60' Bus Repair Bay	65°F	+/-4°F	59°F	Ambient		
60" Bus Prev Maint Bay	65°F	+/-4°F	59°F			
60" Bus Tire Bay	65°F	+/-4°F	59°F			
60' Bus Minor Body Repair	65°F	+/-4°F	59°F			
60' Bus Chassis Wash	55°F	+/-4°F	49°F			
Common Work Area	65°F	+/-4°F	59°F			
Portable Equip Storage	65°F	+/-4°F	59°F			
Tool Box Storage	65°F	+/-4°F	59°F			
AC Shop Storage	65°F	+/-4°F	59°F			
Battery Rebuild Shop	65°F	+/-4°F	59°F			
Tire Shop Storage	65°F	+/-4°F	59°F			

Area/Item	Winter Parameters			Summer Parameters		
	Design	Performance Tolerance	Availability Threshold	Design	Performance Tolerance	Availability Threshold
3.13 Lube Compressor Room	55°F	+/-4°F	49°F	Ambient		
Minor Body Shop	65°F	+/-4°F	59°F	Ambient		
Electronic Bench Shop	65°F	+/-4°F	59°F	74°F	+/-4°F	80°F
4. Fare Box & Clipper Card Reader Repair						
Gen Module Offices	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
Storage & Shops	65°F	+/-4°F	59°F	Ambient		
5. Service & Clean						
Supervisor Office	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
Service Position	65°F	+/-4°F	59°F	Ambient		
Bus Wash Bay/Water Reclamation	55°F	+/-4°F	49°F	Ambient		
Cleaning Equip Storage	Per Code	+/-4°F		Per Code	+/-4°F	
6. Parts						
Parts Areas	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
Parts Lockers	Per Code	+/-4°F		Per Code	+/-4°F	
Break Room	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
Parts Window/Shopkeeper/Parts Storage/Ship & Rec	65°F	+/-4°F	59°F	74°F	+/-4°F	80°F
Rec Office	65°F	+/-4°F	59°F	Ambient		
Battery Storage	65°F	+/-4°F	59°F	Ambient		
7. Maintenance - Administration						
All Areas	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
8. Operations - Administration						
All Areas	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
9. Transit Service (MRO)						
All Areas	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
10. Shared						
Conf/Fit Rooms	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
Fitness Room	65°F	+/-4°F	59°F	74°F	+/-4°F	80°F
Building Engineer/Storage	65°F	+/-4°F	59°F	Ambient		
Revenue Office	65°F	+/-4°F	59°F	Ambient		

Area/Item	Winter Parameters			Summer Parameters		
	Design	Performance Tolerance	Availability Threshold	Design	Performance Tolerance	Availability Threshold
Meet & greet	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
Security Office	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
Lactation Room	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F
11. Training						
All Areas	68°F	+/-4°F	62°F	74°F	+/-4°F	80°F

Bus Wash Floor Area Heating

For the purposes of the Bus Wash Floor Area Heating Area:

- An Availability Failure will occur when the temperature drops below the minim design tolerance of 49°F

Ventilation Tolerances:

For the purposes of ventilation, performance will be monitored through space temperature.

Lighting Levels:

For the purposes of Space Lighting:

- A Service Failure will occur when the lighting is below the Minimum Design as identified in Table 1 – Performance Parameters for Space Temperatures below, during core hours only
- An Availability Failure will occur when lighting level is below the Minimum Design and deemed to be unsafe for work, as determined by the City, at all times.

Table 2 – Performance Parameters for Space Lighting

Area/Item	Lighting Parameters		
	Minimum Design (fc)		Comment
10.Shared			
Building Eng/Building Storage	20		
Security Office	35		
Lobby	35		

Plumbing Systems:

For the purposes of Domestic Hot Water:

- A Service Failure will occur if the temperature is outside of the Performance Tolerance range as identified in Table 3 – Performance Parameters for Domestic Hot Water, but below the Availability Threshold. For greater clarity, a Service Failure will not occur if the temperature is within the provided Performance Tolerance range (‘+/-‘)
- An Availability Failure will occur if the temperature is outside of the Availability Threshold range

Table 3 – Performance Parameters for Domestic Hot Water

Item	Design	Performance Tolerance	Availability Threshold
Domestic Hot Water	140°F	+/-5°F	+/-15°F

For the purposes of Shower Water Temperatures:

- A Service Failure will occur if the temperature is below the minimum Performance Threshold but equal to or greater than the minimum Availability Threshold as identified in Table 4 – Performance Parameters for Shower Temperature below. Alternatively, a Service Failure will also occur if the temperature is above the maximum Performance Threshold but equal to or below the maximum Availability Threshold.
- An Availability Failure will occur if the temperature is below the minimum Availability Threshold or above the maximum Availability Threshold
- Note the above Performance Requirements are to apply within the limits of the final system capacity

Table 4 – Performance Parameters for Shower Temperature

	Performance Thresholds		Availability Thresholds	
	Min	Max	Min.	Max.
Shower Water Temperature	100°F	105°F	95°F	110°F

For the purposes of Compressed Air

- An Availability Failure will occur if the provided compressed air pressure is below the minimum Availability Threshold or above the maximum Availability Threshold as identified in Table 5- Performance Parameters for Compressed Air System

Table 5- Performance Parameters for Compressed Air System

	Availability Thresholds	
	Minimum	**Maximum**
Compressed Air System	166.25 psi (175 psi - 5%)	183.75 psi (175 psi+5%)

Appendix B - Summary of Reports

The following summarizes the reports and plans required by these IFM Specifications.
Note that other specific reporting requirements may exist however generally are included in a formal report as part of the list below.
This list is for convenience only and is not to be relied upon. The reporting requirements in the Technical Specifications should be consulted and shall be adhered to.
Note that the term Service Report in the performance measurements includes all reporting requirements.

Reports Submitted Monthly

Report Name	Description
Maintenance Status Report	PPC shall provide a report detailing the following: • Past month's performance on Demand Maintenance • Past month's performance on Scheduled Maintenance • Monthly Scheduled Maintenance activities for the upcoming month
Operational Report	PPC shall prepare on operations report with the following: • An executive summary • A summary of major activities and issues during the past month for each PPC service category as well as general responsibilities such as quality, risk management, OH&S, Contractor procurement and management, etc. • A summary of all demand requests with statistics, graphs and analysis of trends and action to be taken based on the results • Human resources reporting including training, orientation, certificates, personnel and organizational changes, etc. • Statutory compliance
Performance Monitoring Report	The Performance Monitoring Report shall document all results and related failures along with the related deductions in accordance with Exhibit 4 (Payment Mechanism). A quarterly roll-up report shall be prepared to support invoicing and payment of the Quarterly Availability Payment. The Performance Monitoring Report shall also include a space trending report showing space temperatures during the period and identifying any rooms which have missed the required performance standards.
Renewal Work Report	PPC shall provide a report detailing the following: • Completed Renewal Work projects year-to-date • Renewal Work activities for the upcoming month
System Availability Report	PPC shall prepare a monthly report of the Performance Monitoring Program, comprised of a summary of all Service Failures and Availability Failures and the related performance details and applicable financial adjustment to the invoice in accordance with Exhibit 4 (Payment Schedule).
Monthly Energy Report	PPC shall prepare energy reports as required in Exhibit 12 (Energy Management)

Reports Submitted Annually

Report Name	Description
Annual IFM Services Report	The Annual Summary report shall be provided by PPC to City no more than 20 Business Days following the completion of each Contract Year. This report shall be in a similar format to the monthly report however with an annual summary of results and information.
Annual Scheduled Maintenance and Renewal Work Schedule	PPC shall provide the Annual Scheduled Maintenance Schedule outlining major Scheduled Maintenance planned for the next Contract Year that may impact SFMTA O&M Services. PPC shall provide a planned Renewal Work schedule to the City annually on a date to be agreed with the City. This schedule shall include the proposed start and completion dates of each project.
Annual Service Plan	PPC will develop the Annual Service Plan in accordance with the items listed below at a minimum. PPC may include additional information as appropriate. • A brief narrative overview or executive summary of PPC's approach to delivery of IFM Services • The plan for delivery and provision of each of the IFM Services, including upcoming procurement activities, changes, audits, etc. along with potential impacts to City. • A detailed organizational and staffing plan for the upcoming Contract Year. • Activities or initiatives that may cause disruption to City or other users of the Facilities and the methods and/or accommodations PPC will implement to minimize such disruptions. • An analysis of past performance and upcoming changes to improve delivery of the IFM Services. • Recommendations for changes to any joint service protocols and procedures between PPC and City. • Any proposals for changes to IFM Services or the procedures that may impact SFMTA O&M Services. • Subsequently the Annual Services Plan shall be reviewed and revised by PPC annually and re-submitted to City.
IFM Services Procedures (revisions as necessary)	PPC shall develop IFM Services Procedures for the service areas to provide services in accordance with the relevant sections in Exhibit 18(Technical Requirements). These may be incorporated in PPC's overall procedure documentation and may be standard procedures, however all unique City requirements are to be addressed.
Renewal Work Plan	PPC shall: • Provide an initial 30-year Renewal Work Plan prior to Substantial Completion identifying the renewal projects planned in each Contract Year. • Provide a revised Renewal Work Plan to the end of the IFM Period annually as part of the Annual Service Plan, reflecting any changes to the planned projects.

Report Name	Description
	• Provide a summary of Renewal Work completed or in progress as part of the Annual Service Plan. • Provide a summary and status of completed, in progress, and upcoming work in the monthly management reports and meetings.
Renewal Work Schedule	PPC shall: • Provide Renewal Work schedule for each subsequent Contract Year at least 3 months prior to the commencement of the Contract Year. • The plans should identify the projects schedule for that Contract Year, the planned start and completion dates and potential impacts on SFMTA O&M Services. • Where schedules have a potential impact on SFMTA O&M Services, City may require PPC to change their schedule and/or provide a plan to demonstrate mitigation of impact of risk to SFMTA O&M Services.
Satisfaction Survey Report	PPC shall report results to City: • Provide survey results and analysis within 30 days of the close of the survey for each occupant satisfaction survey or 30 days after each Quarter for the Transaction Survey • Provide an action plan within 45 days of the close of the survey
Energy Analysis Report	PPC shall prepare energy reports as required in Exhibit 12 (Energy Management)

Reports Submitted on an Ad-Hoc Basis

Report Name	Description
Emergency Action Report	PPC shall provide an emergency action report following an Emergency that outlines the emergency, action taken and recommended mitigation to prevent future occurrences.
Performance Action Plans	Where the City (directly or through the PPC) observes a significant or consistent non-performance on any IFM Services, the PPC shall prepare a Performance Action Plan (“PAP”) upon request by the City. The PAP will be due five Business Days from the request of an alternate later date as identified by the City. The PAP submitted to City will, at a minimum, contain a summary of the issues raised by City, an analysis of the root causes of the issues, the steps that will be undertaken by PPC to address the issues and specific timeframes for such steps.
Report on permits, licenses and approvals associated with PPC work	The PPC shall provide an annual report on permits, licenses, and approvals associated with work conducted by PPC.

Appendix C – Handback Residual Life Schedule

Project Component	Residual Life
Exterior Walls and Foundations	10 years
Roof membrane	5 years
Exterior Windows	10 years
Ceilings	10 years
Interior Walls and Partitions	10 years
Interior Windows	10 years
Domestic hot and cold water service	5 years
Chillers	10 years
Boilers	5 years
Cooling Towers	5 years
Air Handling Units	5 years
Low and medium voltage switchgear	10 years
Elevator cabs and panel boards	5 years
Vehicle Ramps	10 years
Flooring and parking surfaces	5 years
Compressed Air System	5 years
Fire Protection (fire pump, control panel, major sprinkler system components)	5 years
Heat Pumps, Chilled Beams, Large Fans > 1,000 CMF	5 years
Building Automation System	5 years
Standby Power System	10 years
Main Electrical Gear	10 years

Appendix D – PPC Spaces

The following areas outlined from the Contract Drawings capture spaces that the PPC will have O&M and Lifecycle responsibility in accordance with these Technical Requirements:

Room Tag	Name	Floor	Department	O&M Responsibility	Lifecycle Responsibility
Unlabelled	LOBBY	Ground	09 - Shared	X	X
MEP020	MAIN ELECTRICAL ROOM	Ground	09 - Shared	X	X
MEP021	MECHANICAL ROOM	Ground	09 - Shared	X	X
MEP022	ELECTRICAL ROOM FOR CHARGERS	Ground	09 - Shared	X	X
01.1.02-65	FM SPARE PARTS STORAGE	Ground	FMO	X	X
09.1.08A	MAIN POINT OF ENTRY	Basement	09 - Shared	X	X
09.1.09	BICYCLE PARKING	Basement	09 - Shared	X	X
05.1.09	STAGING	Basement	05 - Parts	X	X
05.1.11	DOCK	Basement	05 - Parts	X	X
05.1.12	SHIPPING & RECEIVING	Basement	05 - Parts	X	X
09.1.14	TRASH/ RECYCLING/ COMPOST COMPACTOR	Basement	05 - Parts	X	X
09.1.18	ELECTRICAL ROOM ALLOWANCE	Basement	09 - Shared	X	X
09.1.19-01	MECHANICAL ROOM ALLOWANCE	Basement	09 - Shared	X	X
TBD	ELEV. CONTROL RM.	Basement	09 - Shared	X	X
MEP007	DCW BOOSTER ROOM	Basement	09 - Shared	X	X
MEP008	GREY WATER TANK	Basement	09 - Shared	X	X
MEP009	RAIN WATER TANK	Basement	09 - Shared	X	X
MEP010	PROCESSING PLANT	Basement	09 - Shared	X	X
MEP012	500,000 GALLON FIRE WATER TANK	Basement	09 - Shared	X	X
MEP013	INSTRUMENT ROOM	Basement	09 - Shared	X	X
UN0902	BYC FIRE PUMP	Basement	09 - Shared	X	X
UN0903	DIESEL STORAGE ROOM	Basement	09 - Shared	X	X
CSP01	CAR SHARE PARKING	Basement	Car Share Park	X	X
CSP02	CAR SHARE PARKING	Basement	Car Share Park	X	X
CSP03	CAR SHARE PARKING	Basement	Car Share Park	X	X
CSP04	CAR SHARE PARKING	Basement	Car Share Park	X	X

Room Tag	Name	Floor	Department	O&M Responsibility	Lifecycle Responsibility
CSP05	CAR SHARE PARKING	Basement	Car Share Park	X	X
UN001	STORAGE	Basement	FMO	X	X
UN002	STORAGE	Basement	FMO	X	X
UN003	STORAGE	Basement	FMO	X	X
FMOP01	FMO PARKING	Basement	FMO	X	X
FMOP02	FMO PARKING	Basement	FMO	X	X
FMOP03	FMO PARKING	Basement	FMO	X	X
09.1.01	LOBBY	Level 2	09 - Shared	X	X
09.1.08	TELECOMMUNICATION ROOM	Level 2	09 - Shared	X	X
09.1.12	SECURITY OFFICE	Level 2	09 - Shared	X	X
09.1.13-01	GENDER NEUTRAL ACCESSIBLE RESTROOM	Level 2	09 - Shared	X	X
09.1.19-02	MECHANICAL ROOM ALLOWANCE	Level 2	09 - Shared	X	X
09.1.19-03	MECHANICAL ROOM ALLOWANCE	Level 2	09 - Shared	X	X
09.1.19-04	CHILLER ROOM	Level 2	09 - Shared	X	X
09.1.19-05	MECHANICAL ROOM ALLOWANCE	Level 2	09 - Shared	X	X
09.1.19-07	BOILER ROOM	Level 2	09 - Shared	X	X
09.1.19-08	HVAC ROOM	Level 2	09 - Shared	X	X
09.1.19-09	MECHANICAL ROOM ALLOWANCE	Level 2	09 - Shared	X	X
MEP023	ELECTRICAL ROOM FOR CHARGERS	Level 2	09 - Shared	X	X
MEP024	ELECTRICAL ROOM FOR CHARGERS	Level 2	09 - Shared	X	X
MEP025	ELECTRICAL ROOM FOR CHARGERS	Level 2	09 - Shared	X	X
MEP026	ELECTRICAL ROOM FOR CHARGERS	Level 2	09 - Shared	X	X
UN103	STORAGE	Level 2	09 - Shared	X	X
UN203	SFMTA OPEN SPACE	Level 2	09 - Shared	X	X
01.1.02-65	FM SPARE PARTS STORAGE	Level 4	FMO	X	X
01.1.02-65	FM SPARE PARTS STORAGE	Level 3	FMO	X	X

Division 8: Public Benefit Principles

[This document will be incorporated at a later stage as a reference document within the IF Project Agreement]

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Division 9: SFMTA's Communications Division's Public Outreach and Engagement Requirements (POER) v.1.0

Public Outreach and Engagement Requirements

v.1.0

POETS

Public Outreach
& Engagement
Team Strategy

SFMTA

Table of Contents

Note to PPC:
The following hyperlinks have been eliminated because they are only for internal use of SFMTA staff.

- Appendix
- Intranet
- Calendar

Introduction

The San Francisco Municipal Transportation Agency (SFMTA) is committed to involving the people of San Francisco in the decisions that shape the city's transportation system. This commitment is expressed in the agency's Strategic Plan and through our ongoing investment in the Public Outreach Engagement Team Strategy (POETS). It is based on an understanding that:

- Those who are affected by government decisions should be informed and have an opportunity to participate in the decision-making process;
- The community's trust in the public process directly affects our ability to deliver projects; and
- Most projects must meet legal requirements related to public notification and participation.

The agency's approach to working with the communities we serve is reflected in our core values:

RESPECT
We are courteous and constructive in our treatment of others. We recognize that our colleagues and their contributions are vital to the agency. We listen and directly engage our colleagues and the public to understand their needs and deliver effective services.

INCLUSIVITY
We seek a variety of identities, abilities, and interaction styles to promote a diverse and fair workplace. We operate from the context of teamwork and positive intent. We serve the public and address historic inequities in transportation by including all communities in the agency's decision-making processes.

INTEGRITY
We are accountable for and take ownership of our actions. We are responsive and honor our commitments to our colleagues and stakeholders. We are transparent and honest in everything we do, from internal operations to external delivery.

To ensure consistent public communications and outreach across projects, the SFMTA established our Public Outreach and Engagement Team Strategy (POETS). The main components of POETS are: **Requirements** for every project, **Resources** to support staff, **Relationships** with the community, and **Recognition** of outstanding work.

This document presents the requirements for public outreach and engagement that every SFMTA project is expected to meet. More information about the other components of the Public Outreach and Engagement Team Strategy, including supportive resources and recognition opportunities for staff, can be found on the POETS page located on the SFMTA intranet. The process of developing the SFMTA's requirements and guidance involved extensive feedback from the community. It is strongly recommended that you review the summary of this valuable input in the Appendix.

Public Outreach and Engagement Requirements

To ensure a consistent approach throughout the agency, all managers and leads responsible for SFMTA projects that impact the public must ensure that their project teams do the following:

- **PLAN** for public outreach and engagement for the project
- **IMPLEMENT** the public outreach and engagement plan
- **DOCUMENT** the implementation of the plan and the feedback received

Develop the Plan

Every SFMTA project must develop a Public Outreach and Engagement Plan at the outset of the project, and the project team must evaluate and revise the plan at each subsequent project phase. The plan should be reviewed within the division by the direct report manager and/or the POETS Division Lead. Each division is responsible for establishing a process to determine when a Public Outreach and Engagement Plan is considered complete and ready for submission to the POETS webpage. Whatever the protocol for deciding who submits the plan, the project manager/lead is ultimately accountable for ensuring that it occurs. **When the Public Outreach and Engagement Plan is considered complete according to the division's process, it must be uploaded to the POETS page on the SFMTA intranet, where all Public Outreach and Engagement Plans are tracked. Keep in mind that every plan is a public document and may be reviewed at any time by SFMTA leadership and staff, city partners and members of the public.**

To help empower staff to meet these requirements, the agency provides a Guide and Template for creating a Public Outreach and Engagement Plan. These companion documents include guidance on doing a project needs assessment to identify stakeholders and impacts, writing a project brief, crafting key messages for target audiences, identifying the opportunities for public participation, selecting outreach and engagement techniques, establishing goals and measurable objectives, scheduling activities and tasks, evaluating the plan, and reporting back to the public.

At a minimum, every Public Outreach and Engagement Plan MUST include:

- Identification of who should be involved in developing the plan (staff, consultants, partners)
- Identification of project stakeholders, impacts, and decision space
- Early engagement of key stakeholders
- Use of multiple communication channels to reach audiences
- Compliance with language & accessibility requirements
- Consideration of the Racial Equity Action Plan and Toolkit
- Goals and measurable objectives for each phase of the project
- A method to document plan implementation and to collect data related to goals and objectives
- A strategy for outreach during all project phases, including detailed design and construction
- Sufficient budget to carry out the activities specified in the plan
- Coordination with other SFMTA projects that affect the project
- Coordination with other city partners who will be involved with the project

- A report submitted to the POETS webpage after each project phase

It is important to emphasize that the development of the Public Outreach and Engagement Plan should be a team effort. Those staff members who will be directly involved in the implementation of the plan should have input in the creation of the plan. Several aspects of the plan require careful consideration and judgement without hard and fast rules (e.g., stakeholder identification, impact analysis, budget). Involvement of key team members (including any consultants and partners) allows for a thoughtful and collaborative process and lays the groundwork for better understanding and successful implementation of the plan. In the case of projects with significant impacts on the community, it is also advisable to consult key stakeholders for their input as the plan is being developed (e.g., for advice on the most effective ways to keep particular communities informed).

Note that it is not mandatory to use the specific planning Template offered by POETS, but any Public Outreach and Engagement Plan must include comparable content regardless of the format, and any document used to satisfy these requirements must be uploaded to the POETS page on the SFMTA intranet. The Guide and Template provide detailed instructions for the content of any Public Outreach and Engagement Plan.

Programmatic Public Outreach and Engagement Plans

Every SFMTA project that impacts the public must implement its Public Outreach and Engagement Plan. Larger, more complex projects require their own detailed plans. In addition to large projects, the SFMTA routinely implements many smaller, similar projects (e.g., stop signs, signal changes) that can rely on a single, programmatic Public Outreach and Engagement Plan. Divisions that deliver such projects should develop programmatic outreach and engagement strategies that apply to typical projects in each category. Every small project must still consider community impacts, but the programmatic plan can be used as a template by each project. Only the programmatic plan that will serve as the template for projects in a given category must be uploaded to the POETS page on the SFMTA intranet, not the plans for each project. However, every project that falls within a program category must have a plan based on the programmatic template. While project teams are not required to upload each plan to the POETS webpage, they are responsible for implementing the plan and can be held accountable. Project teams should also report to POETS Division Leads any lessons learned from individual projects that suggest changes needed to the programmatic plan template going forward.

What is a "Project"?

For the purpose of these requirements, the SFMTA defines a project as, "A one-time effort to construct, acquire, replace, improve, expand, or rehabilitate the transportation system in the City and County of San Francisco." The Public Outreach and Engagement Requirements apply to all capital projects, as well as one-time policy initiatives that are not capital in nature (including those that occur in multiple phases). Smaller, routine "projects" are sometimes classified as "operations." Regardless of terminology, any action that impacts the public is subject to compliance with the Public Outreach and Engagement Requirements. As discussed below, there are specific guidelines for smaller, routine projects.

Review the Public Outreach and Engagement Plan between Phases

The initial Public Outreach and Engagement Plan should describe the plan for public outreach and engagement for each phase of the project, with the assumption that the strategy for later phases will be adapted based on what is learned during implementation of earlier phases. The Public Outreach and Engagement Plan should be reviewed and updated at the end of each phase of the project. In cases where projects transition from SFMTA to another agency between phases, it is essential to coordinate with those city partners to maintain a consistent standard of outreach and engagement, even if the SFMTA is not the lead agency during a particular phase of the project. In order to achieve a successful transition for larger projects, POETS recommends funding for a Public Information Officer to work with the city partner(s) throughout the transition and until project completion.

There are good reasons to review the Public Outreach and Engagement Plan between phases. First, it gives the project team an opportunity to think about lessons learned at the completion of each phase and to incorporate those lessons into the next phase. Second, there is understandable uncertainty at the beginning of a project about the kind of public outreach and engagement that will be necessary during later phases (especially if the project will take years to complete).

Internal Coordination

In planning for public outreach and engagement for a single project, it is important to know which other teams and projects within the SFMTA (including those in different divisions) might connect with, intersect or impact your project. Brief related staff and teams on your Public Outreach and Engagement Plan as early in the process as possible.

Challenging Phases: Detailed Design and Construction

For projects that take years to complete, it is impossible to anticipate all aspects of outreach and engagement that will be needed to complete the project. The most challenging phases to include in the initial plan are detailed design and construction. While decision space is typically less during these phases (plans have been made, the project is legislated), it is essential to keep stakeholders informed and to continue to engage the community beyond the planning phase.

During the detailed design phase, it can feel to the community like the project is inactive. It is not uncommon for this phase to continue for several years, during which the community itself changes (there are new residents and merchants who never heard of the project and were not part of the planning phase). During the construction phase, project impacts are felt most acutely by the community and there may be new stakeholders affected who were not involved during project planning. Because these phases present unique challenges, the project team should closely review the original Public Outreach and Engagement Plan before detailed design and construction to create a more detailed and updated strategy. The Appendix provides examples of plans for the detailed design phase.

The City and County of San Francisco Construction Mitigation Program defines the measures that are required for construction mitigation for various kinds of projects (low, moderate and major impact). Construction Mitigation Plans should be created in advance of construction, developed in collaboration

with merchants and residents, and budgeted separately from the initial Public Outreach and Engagement Plan. The Appendix includes a summary of the program, along with a presentation and example plans.

Submit the Plan

Every Plan must be uploaded to the POETS webpage upon completion and prior to implementation. The process of approving and submitting the plan is left to the discretion of each Division. Each division must determine its own protocol for deciding when a Plan is complete and ready to be submitted. Regardless of the division's process, project managers/leads are accountable for compliance at the project level.

Implement the Plan

Once your Public Outreach and Engagement Plan is submitted to the POETS webpage, the project team is responsible for carrying it out. As noted above, the project manager/lead is ultimately accountable for implementation of the plan. The Public Outreach and Engagement Guide and Template provide advice and tools designed to help schedule and track activities. In addition, the SFMTA Public Outreach and Engagement Manager, the POETS web page, Division Leads and District Liaisons can offer information and contacts to project teams as they implement their plans. The role of the POETS Division Leads is to ensure compliance with these requirements within each division and to provide support to project managers/leads and their teams, including referrals to appropriate resources. District Liaisons are designated staff members within the SFMTA who can provide geographically specific information and contacts to project teams.

Compliance with Language Assistance Requirements

As a city department that receives federal funding, the SFMTA must follow both local rules (San Francisco's Language Access Ordinance) and federal rules (Title VI of the Civil Rights Act of 1964 and supporting guidance) regarding accessibility to our programs and services to ensure that all customers, regardless of their ability to read, speak, write and understand English ("limited-English proficient" or "LEP"), are informed and able to participate in our agency's decision-making processes. The SFMTA's 2016 Language Assistance Plan (LAP) details the agency's policies about providing both written (translations) and verbal (via interpreters or bilingual employees) language assistance for our limited-English proficient customers and other stakeholders.

The Language Assistance Plan includes maps detailing concentrations of limited-English proficient communities by language, which can be used as a resource when determining the language needs of those who are affected by the project. In general, and at a minimum, most public information pieces should be translated into Chinese, Spanish and Filipino (Tagalog), and all public communications and meeting notices must include the 311 "Free Language Assistance" tagline (included in the Public Outreach and Engagement Plan Guide). Public meeting and hearing notices and agendas, including those posted at SFMTA.com, must include the four-language 48 hours' notice and a staff person's phone number for requesting language assistance; LanguageLine telephonic interpretation services can be used to process requests from limited-English proficient customers via phone. The Appendix provides a LanguageLine

reference sheet and includes all language assistance taglines. Depending on content, transit related public information pieces might require additional translation support.

When considering language accessibility, the agency provides resources and training to assist with implementation. Guidelines and tips to providing language assistance can be found in the Appendix. Specific language assistance questions and requests for individual consultation or staff training should be directed to SFMTA Regulatory Affairs Manager Kathleen Sakelaris at Kathleen.Sakelaris@sfmta.com or 415.701.4339.

Planning for Equity

Regardless of the specific activities outlined in your Public Outreach and Engagement Plan, its implementation must be inclusive and equitable. The plan should include methods for soliciting feedback that engage and are accessible to those who have historically been underrepresented in the public process, including low-income households, people of color, youth, seniors, and people with disabilities.

The core principle that informs the practice of public outreach and engagement is that those who are affected or have been historically disenfranchised by government decisions have a right to be included in the decision-making process.

The SFMTA has worked with the Local and Regional Government Alliance on Race and Equity (GARE) to develop a Racial Equity Action Plan and Toolkit that promotes diversity and inclusion internally and with the communities we serve. This signals the agency's intention both to apply a racial equity lens to project-level planning and implementation, and to build the organization's capacity and skills to achieve greater equity as an overall outcome of our work.

While it may be more difficult and require more resources to reach and engage members of underrepresented communities, it is essential to make a deliberate effort to do so. Equity should be a primary consideration in establishing goals and objectives for the plan, and project teams should measure success with appropriate data. Teams should also seek to partner with stakeholders in developing and implementing the plan in order to achieve results that are meaningful to the community.

Required Notification

When implementing any plan, the legal minimum distance for notification about the project should be treated as a starting point. In some cases, those neighborhoods and stakeholders who are affected by the project will extend beyond the minimum required distance, warranting broader notification. All Public Outreach and Engagement Plans — including programmatic plans for smaller projects — require an assessment of the project's impacts. The expectation is that every project team will plan for notification based on a thoughtful consideration of the anticipated impacts of the project and those community members who will actually be affected.

Online Presence

Every SFMTA project is required to have an online presence, either a page on the agency website or an equally accessible and comparable alternative. At a minimum, the information posted online should include a project description, project history and current phase, opportunities for public input, and contact information for the project manager/lead and anyone else who is responsible for answering

questions about the project. If the website is designed to receive written questions or comments, it must be monitored regularly so that staff can reply in a timely manner if a response is appropriate.

SFMTA Calendar

Every public meeting associated with the project must be posted on the SFMTA master calendar at least as early as the meeting is announced through other channels.

Document the Plan

Project teams must track key indicators related to outreach and engagement by documenting:

- How the Public Outreach and Engagement Plan was implemented (and any changes in implementation from the original plan)
- Any input received from the public
- How public input influenced the project (and the reasons why or why not)
- How public input was presented to decision makers
- The indicators established for the plan's goals and objectives

At the end of each project phase the team must complete a brief summary of lessons learned and recommendations for the next project phase. When you complete this brief report ("Plan Evaluation" on page 11 of the Template), submit an updated version of your plan (including answers to the evaluation questions and any revisions to the plan itself) to the POETS web page. Add a date to the file name to distinguish it from previous versions.

Close the Feedback Loop

From the community standpoint, documentation of public input is essential to closing the "feedback loop." If the plan calls for public consultation, the stakeholders who participate should know how their input was conveyed to decision makers and whether it had any influence on the outcome. This can only happen if the project team documents public input and the process by which they took it into account. For this reason, the Public Outreach and Engagement Plan should always include a plan to report back to stakeholders at the end of each project phase.

From an internal perspective, planning for public outreach and engagement is an ongoing process, and each project team is expected to review and revise previous plans as the project moves through each phase. To make informed decisions, the team needs to know what was learned from public participation in earlier phases. Documentation at the project level also supports an accumulation of lessons throughout the agency that can inform future practice on other projects. It also provides elected and appointed officials with essential information to inform their decision-making.

Accountability

All SFMTA projects that impact the public are subject to the Public Outreach and Engagement Requirements. Project managers are accountable for meeting the requirements, and failure to adequately plan for and implement public outreach and engagement can jeopardize project funding and delivery at any phase.

A General Notice from the Project Management Office specifies procedures to ensure compliance with these requirements. It states that the needs assessment should be conducted at project inception, and the expected cost of outreach and engagement should be included in the original project budget. The Public Outreach and Engagement Plan must be integrated into the project's pre-development report, ensuring that it will be completed no later than the end of the planning phase.

Throughout all phases of the project, there are multiple opportunities for review of the Public Outreach and Engagement Plan. These include:

- Review of funding requests for planning and preliminary engineering through the Project Integration Committee and the Transportation Capital Committee;
- Review of phase milestones by the Project Management Office before approval of funding for subsequent project phases;
- Review of project implementation by the Project Delivery Technical Advisory Committee;
- Interdepartmental reviews of proposed street changes by the Transportation Advisory Staff Committee (TASC) and related internal reviews by the Pre-TASC Engineering public hearings;
- Development of a Construction Mitigation Plan, which is explicitly required to comply with the Public Outreach and Engagement Requirements.

In addition to these structured opportunities for review, every plan is subject to random audit by agency leadership. The POETS team is available to provide support in developing strategies and budgets for outreach and engagement to ensure that projects comply with the requirements.

Conclusion

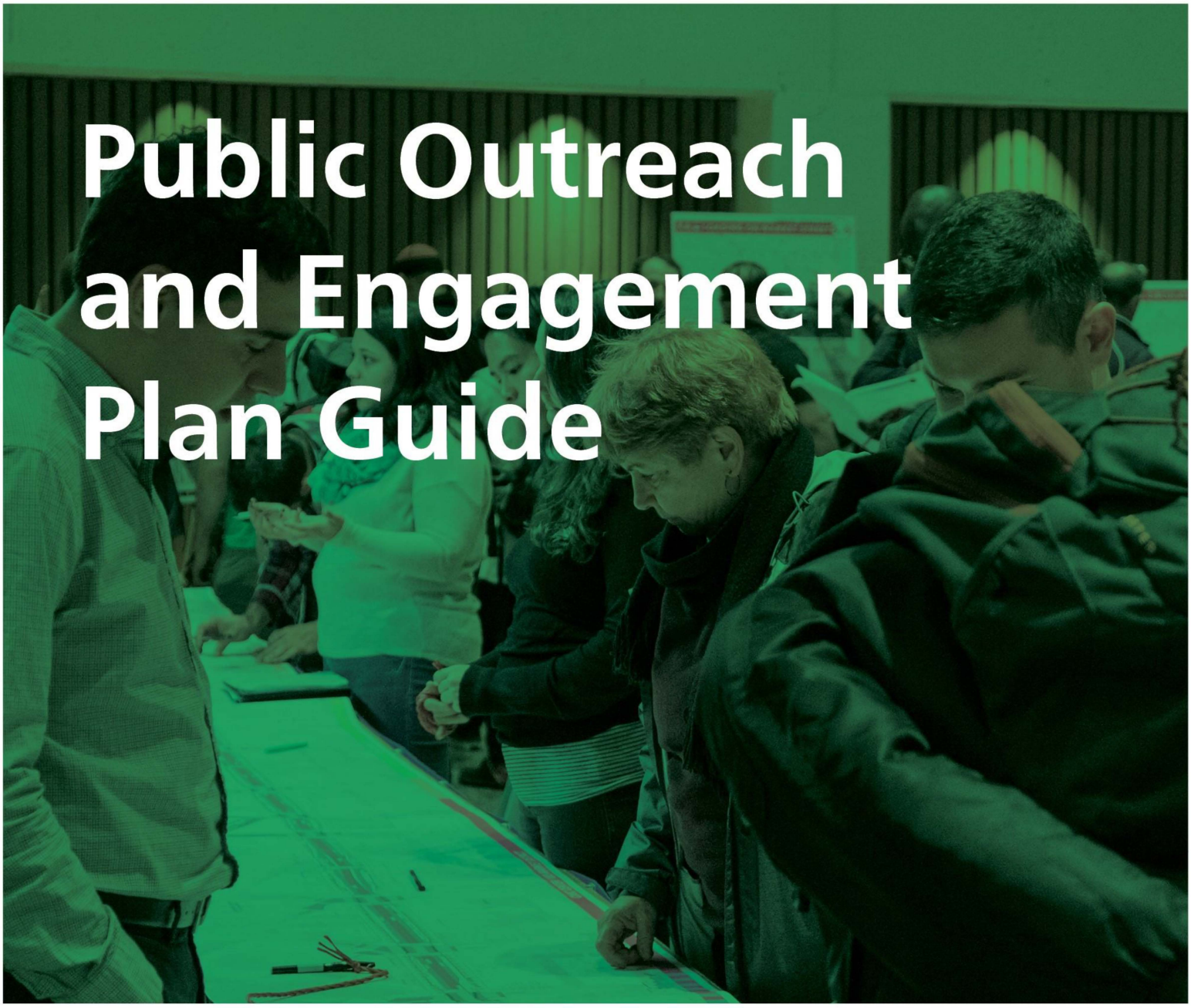
These requirements are meant to hold the SFMTA to a high standard of practice for public outreach and engagement. At the same time, the POETS program is designed to give staff members the support they need to meet the requirements. The Public Outreach and Engagement Plan Guide and Public Outreach and Engagement Plan Template, companion documents to these requirements, provide a blueprint for how to develop, implement and document an appropriate strategy for each project. In addition, the POETS team and Division Leads are available to offer guidance on an ongoing basis as project teams create and revise their plans. As part of that support, the POETS webpage includes a wealth of resources and training opportunities available to staff members who work with the public.

The purpose of the Public Outreach and Engagement Requirements is to ensure that those who are affected by the SFMTA's decisions and actions are included in the decision-making process, and that the

interests of the community are carefully considered as the agency carries out its mission of maintaining and improving San Francisco's transportation system. A related goal of these requirements is to give every SFMTA project the best possible chance to be delivered smoothly, anticipating challenges and avoiding extreme course corrections. Thoughtful planning is the key, and the needs and concerns of the community must be an integral part of that process. In the end, the POETS approach of establishing high standards and providing the necessary support to meet them is intended to strengthen the position of staff who are responsible for working with the public. By taking the time up front to plan for meaningful public outreach and engagement, project teams are more likely to have a positive experience in the community and will be more confident and better prepared to deliver their projects with outstanding results.

Division 9 – Exhibit A
Public Outreach and Engagement Plan Guide

Public Outreach and Engagement Plan Guide



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POETS

Public Outreach
& Engagement
Team Strategy

SFMTA

Table of Contents

Introduction

The San Francisco Municipal Transportation Agency (SFMTA) moves nearly a quarter million people daily within the city of San Francisco. To fulfill the agency's mission to "connect San Francisco through a safe, equitable, and sustainable transportation system" the agency undertakes more than 200 projects at any given time, including major transit corridor investments, safer designs for local streets, and improvements to all modes of transportation throughout the city.

As the transportation agency for the City and County of San Francisco, the SFMTA has a responsibility to keep the public informed as part of our work. The agency is committed to fulfilling these responsibilities and going above and beyond to engage the public in our work. We are committed to strengthening and sustaining our relationships with the community and to ensuring that the agency delivers quality transportation projects to those who need them. This commitment is expressed in the SFMTA's Strategic Plan and through our ongoing investment in the Public Outreach and Engagement Team Strategy (POETS).

The purpose of this document is to guide those staff members who conduct public outreach and engagement and clarify the agency's expectations for what must be included as part of the public outreach and engagement planning process. This guide is a companion to the Public Outreach and Engagement Plan Template, which project teams can use to develop a plan that meets our agency's requirements for conducting public outreach and engagement. The Public Outreach and Engagement Requirements outline what is expected to occur as part of agency outreach to the public on any given project.

The first section of this document provides instructions for using the fillable Template to create a Public Outreach and Engagement Plan. The second section presents general principles, practices and tips to consider when developing a plan. The final section summarizes the "Spectrum of Public Participation," a helpful framework for thinking about your plan's purpose and goals.

The process of developing the SFMTA's requirements and guidance involved extensive feedback from the community. The agency heard from a range of diverse voices – those who both benefit from our work and are impacted by our projects. A summary of this valuable community input is included in the Appendix.

Guide to Public Outreach and Engagement Planning

This section provides a step-by-step guide to develop a project-level Public Outreach and Engagement Plan in accordance with the agency's Public Outreach and Engagement Requirements. Each heading below corresponds to the Public Outreach and Engagement Plan Template, which provides a format for writing a project-level plan. This section supplements the instructions in the Template.

When a project's Public Outreach and Engagement Plan is complete, it is mandatory to submit it to the POETS webpage on the SFMTA intranet here. Note that each division determines its own process for deciding when a plan is ready to be uploaded and who is responsible for doing so. Keep in mind that the Public Outreach and Engagement Plan is a public document and may be reviewed by SFMTA leadership and staff, city partners and members of the public.

Project Overview

The purpose of the Project Overview is to summarize the project scope, purpose, benefits and timeline. It also includes some early considerations about decision space – constraints and decisions that have already been made, and decisions that are yet to be made. When preparing this information, take into consideration that the overview may be used for the project webpage, fliers, etc. Note that the next step (Project Needs Assessment) adds valuable information – project impacts, stakeholders, opportunities for public input – that can be added later to the basic information in the Project Overview.

Project Needs Assessment

A Project Needs Assessment is critical to the planning process. It is your chance to think carefully about those who will be affected by the project, the purpose of your outreach and engagement strategy, and the relationships that will matter most for the success of the project.

The Project Needs Assessment should help to identify three things: stakeholders, impacts and decision space. Note that while the Template presents the identification of these as sequential steps, they are in fact interdependent, and the assessment should be more iterative than linear. As you complete the following steps, consider how each of the components informs the others. For example, understanding what decisions the public can influence might affect the potential impacts and identification of stakeholders.

> Public participation is based on the belief that those who are affected by a decision have a right to be involved in the decision-making process.
>
> - IAP2 Core Value

Within the Project Needs Assessment, the **stakeholder analysis** identifies those audiences that need to be informed and/or engaged. It also suggests a method of gauging the level of outreach that is required. Research on stakeholders should clarify their roles, the degree to which they are organized, their capacity to participate, and specific considerations for ensuring an inclusive and culturally appropriate public process (language, accessibility, barriers to participation, etc.). The Template helps to

identify which key stakeholders should be contacted early on, to make them aware that the project team will be reaching out to the community. Valuable internal resources to help gather the information for the stakeholder analysis include the Public Outreach and Engagement Team, District Liaisons, POETS Division Leads, and the Regulatory Affairs Manager (for help with language access).

The **impact and interest analysis** in the Project Needs Assessment suggests how extensive the outreach and engagement effort should be, and the level of resources that will be needed to carry it out. The table in the Template is designed to be a starting point for discussion among members of the project team. Once you answer the ten questions about anticipated impacts and the level of public interest in your project, you will end up with an average score on a scale of very low to very high. While there is no hard and fast rule about how to interpret this number, a higher score generally suggests that more effort and resources will be needed for community outreach. Answering the diagnostic questions as a team (including the project manager, communications lead, relevant consultants and any staff members who will be doing outreach and engagement) will give you the best chance possible to accurately gauge the public's response to your project.

The **decision space analysis** in the Project Needs Assessment identifies the opportunities for stakeholders to provide input and potentially influence the project. Decision space is normally limited by a variety of constraints: agency goals, direction from policymakers, previous decisions, legal requirements, technical feasibility, available budget, etc. Within these constraints, it is always important to consider whether the decision space can be expanded beyond simply telling the public what is going to happen. Even during construction, when decision space is typically most limited, there might be room to consider input on timing, sequencing or mitigation to address community concerns. One reason for seeking to expand the decision space is to demonstrate the agency's commitment to listen to the public. Another is that community members often have good ideas that can strengthen the project and help you deliver it successfully.

The analysis of impacts and interests is closely connected to decision space. In general, greater impacts and higher levels of concern will raise expectations and put pressure on the project team to give the public a say in shaping the project. It is much easier to suggest that the purpose of outreach is only to inform the public when there are few negative impacts and minimal interest in the project, Therefore, given the constraints that limit decision space, there is a tendency for a higher score on the impact and interest analysis to be associated with a higher level of engagement on the spectrum of public participation described below. In other words, the project impacts and level of public concern are not the only factors that determine decision space, but they are critical to consider in the analysis.

Goals and Objectives

The Project Needs Assessment provides the information needed to establish goals and objectives for the Public Outreach and Engagement Plan. This can be the most difficult task in developing the Public Outreach and Engagement Plan, for at least two reasons. First, it only makes sense to establish goals and objectives if they can be measured. This means that metrics need to be realistic, so that information and data can be gathered to evaluate the success of the plan. Second, it is important to have goals and objectives that are meaningful. The key metrics should measure not only the activities of outreach and engagement (How many people did we reach? How many people attended our meetings?) but also measure the results that matter (How did public input affect the final project? Did our outreach and engagement provide helpful input to decision makers?).

This section provides a brief guide to setting goals and objectives for a Public Outreach and Engagement Plan. The approach is to (1) Keep in mind the agency's goals for working with the public, (2) Establish project goals that correspond to the "levels of participation" on the IAP2 Spectrum, and (3) Establish project objectives that can be realistically measured and related to the project goals.
Every Public Outreach and Engagement Plan should consider the broader agency goals for communication and public participation as expressed in the SFMTA's Strategic Plan and Public Participation Plan. Keep this agency-wide context in mind as you develop project-level goals and objectives.

Strategic Plan Goal 4.0, Objective 4.3 commits the agency to enhance customer service, public outreach, and engagement: "Effective communications and consistent messaging can create meaningful opportunities for community input, give policymakers the information they need to support their communities, and improve the agency's projects and service delivery. Not only is community engagement critical in developing near- term projects that serve the community, it can also benefit long-term, comprehensive efforts related to safety, transit service, and mode choice. Placing this objective in Goal 4 underscores the agency's commitment to not only improve agency communications and engagement processes, but to also overhaul the agency's internal communications processes to better serve the public and agency staff."

The SFMTA Public Participation Plan emphasizes the agency's commitment to inclusion, equity and accessibility. Planning for every SFMTA project should meet these expectations. In practice, this means that project teams should consciously address barriers to participation and should make deliberate efforts to reach out to communities that have been historically underrepresented in the public process.

> "Reach out and listen to people, don't just 'educate' them."
>
> - Stakeholder Feedback

The **goals** of public outreach and engagement for a specific project should correspond to the four levels of public participation on the IAP2 Spectrum: Inform, Consult, Involve or Collaborate. The identification of goals comes directly from the Decision Space analysis in the Project Needs Assessment. Every Public Outreach and Engagement Plan should have the goal to **inform** the public about the project. In addition to informing, most projects will also have an opportunity for the public to provide input that might influence the project. Therefore, most projects will also **consult** to some extent as a goal of the project, with the parameters for potential public influence (the Decision Space) clearly defined. Some projects will also present further opportunities for public partnership and influence, meaning that the goals for public participation might be to **involve** the community or to **collaborate** with stakeholders.

The **objectives** of public outreach and engagement for a specific project should be meaningful and measurable. Objectives should have a meaningful relationship to the goals of the Public Outreach and Engagement Plan (How do we know that the public was informed or consulted? What did we hear that would be helpful to decision makers?). Objectives should also be measurable. Measures can be quantitative (How many people did we reach through various communications channels?) or qualitative (How did the project change as a result of public input?). The key is to create objectives that are linked to the goals for the plan, and that can be documented and communicated to decision makers and the public.

Some examples of Objectives that could correspond to Goals:

- Number of those reached through communications channels and attending meetings
- Number of users accessing the project webpage; number providing online feedback
- Percentage of stakeholders surveyed at meetings who feel informed about the project
- Specific ways that public input influenced the project (a "We Listened" category)

Key Messages

Design your key messages about the project for both general and specific audiences, building on the Project Overview. Keep in mind that the most important consideration is the desired impact of the communication effort within the overall Public Outreach and Engagement Plan. For every project, the goal of communication is to inform the community about the project, its benefits, its impacts, and opportunities for formal public comment. Plans that also call for consulting or involving the community during project planning will require additional information and communication to support an engagement strategy. Successful messaging is not just about content, but also the impact of communication. In all cases, it is important to be consistent and transparent in messaging – providing the community with a clear path to information and staff contacts – in order to build trust throughout the life of the project.

For almost any project, key messages include:

- Purpose and benefits of the project
- Anticipated impacts of the project
- Project timeline and current phase
- Opportunities for public participation
- Project contacts (who and how to reach them)
- Project webpage (how to access further information online)
- Specific messages for specific audiences

In general, key messages should be concise (a few short statements that are easily understood), relevant (limit information to what is essential), compelling (lead with benefits and highlight opportunities for public input) and tailored to the audience (with special consideration of language needs). Use plain language and avoid jargon and acronyms. It is always advisable to check your messages with representatives of the audiences you are trying to reach.

Outreach and Engagement Techniques

The selection of outreach and engagement techniques should be based on the Project Needs Assessment and the project goals and objectives. When the goal is to inform, the techniques used should be tailored to specific audiences. When the goal is to invite feedback from stakeholders, the plan should include techniques and tools designed to gather and compile public input, and it should be specific about the kind of feedback that could affect the project.

The field of practice offers a wide variety of techniques and tools to choose from. The key is to think carefully about the intended purpose of public participation at each phase of the project, and to select

techniques, tools and meeting designs that fit the project goals while getting information to stakeholders in the way they prefer to receive it. Regardless of other considerations, our stakeholders report that all flyers and posters should use large print and plain language, and they should be placed in multiple locations and at various heights. In addition, all electronic communication should be reviewed for accessibility.

The Appendix provides several resources to help you think about techniques: (a) a summary of communication techniques that are commonly used for SFMTA projects, (b) a description of various outreach techniques, engagement strategies and meeting formats that correspond to different goals on the public participation spectrum, and (c) guidance for making meetings accessible.

Schedule and Responsibilities

Once the goals for public outreach and engagement have been determined and the methods have been selected, the next step in developing the Public Outreach and Engagement Plan is to create a schedule of activities and assign responsibility for implementation tasks.

The schedule should be detailed enough to be useful to the project team, but also appropriate as a tool to report to stakeholders, agency partners and decision makers. It should include the timing of specific communications efforts, outreach to key stakeholders, and key meetings or events. It should also note those activities that are ongoing throughout the duration of the plan, as distinct from communications for a specific meeting or event.

Project teams may use their own formats (or those provided by consultants) to track detailed tasks, individuals responsible, and due dates. The format for your project's outreach and engagement strategy can be a single spreadsheet, or a combination of tables for different tasks. The format is less important than the content: When do activities need to happen and who is responsible for carrying them out? When planning public meetings, the action plan should highlight dates for inviting participants, arranging meeting logistics, producing meeting materials, recruiting facilitators, etc. One approach is to create a summary timeline and a separate, more detailed production schedule for individual tasks.

Budget

The budget for Public Outreach and Engagement can be estimated based on the size and scope of the project, as well as the extent of activities in the Public Outreach and Engagement Plan. Costs can vary widely based on staff time, communications collateral, language support, online engagement, and the number of public meetings held.

As noted above, it might be necessary to estimate the budget for public outreach and engagement before the plan is fully developed. To ensure adequate resources are devoted to outreach and engagement (including for language translation and interpretation), it is critical to conduct a Project Needs Assessment as early as possible. If your project requires a budget estimate before the Public Outreach and Engagement Plan is complete, the POETS team or your POETS Division Lead can provide guidance.

Plan Review

Once the Public Outreach and Engagement Plan has been drafted, it is important to review it within the SFMTA before moving to implementation. As a practical matter, the plan should be developed in concert with all of the team members responsible for carrying it out (including staff and consultants), and ideally in consultation with key stakeholders. As noted at the outset of this Guide, one of the first steps in developing the Public Outreach and Engagement Plan should be to identify all of those individuals and groups who should be part of the conversation before the plan is developed and approved.

Any project that will transition from the SFMTA to another city agency (e.g., between legislative approval and construction) must address this transition in its Public Outreach and Engagement Plan. As early as possible, the project lead should meet with city partners to establish roles and budget responsibilities.

The project lead should meet with the District Liaison for the project area to be aware of any other SFMTA projects that might affect your project. If there are intersecting projects, the outreach and engagement activities for both should be coordinated to the extent feasible.

It is always a good idea to review the draft plan with an experienced colleague. Consider reaching out to your POETS Division Lead, a public information officer, or the POETS team if you have questions or challenges while completing your plan.

Once the Public Outreach and Engagement Plan is reviewed internally and with city partners, it must be approved by the project manager and then uploaded to the POETS webpage. At the end of each project phase, the evaluation section of the plan should be filled out and submitted to the same link.

Prior to implementation, the project lead should provide a summary of the project and the Public Outreach and Engagement Plan to the SFMTA's Media Relations Manager and should consider whether to reach out to elected officials (District Supervisors' Aides, State delegation offices).

Plan Evaluation

The Public Outreach and Engagement Plan should be viewed as a living document. Adaptation to changing or unforeseen circumstances is a basic principle of good public engagement. The implementation of the Public Outreach and Engagement Plan should be carefully documented, with records kept on who was contacted and who participated in any meetings held. Ideally, any meeting other than a public hearing should include a feedback form from participants. The Appendix has an example of a meeting evaluation survey. At a minimum, the project outreach and engagement lead should submit a brief report at the end of each phase of the project. The plan should be reviewed and updated every six months if the project phase lasts longer than this.

Review of the Public Outreach and Engagement Plan should include answers to the following questions outlined in the Public Outreach and Engagement Plan Template:

- Was the Public Outreach and Engagement Plan implemented as planned?
- If there were changes in practice from the original plan, please explain.
- How did the plan perform on its identified goals and objectives?
- What were the key lessons learned during implementation?

- What changes would you recommend to the plan going forward?
- How did you document public input and take it into account?

Report Back to Stakeholders

After evaluating the Public Outreach and Engagement Plan, the project team should also report back to stakeholders (including partners and decision makers) at the end of each project phase. What was the purpose of outreach and engagement at this phase of the project? Who was contacted and/or engaged in the public process? What feedback did the public provide? If applicable, how did the project team take public input into account? How was it conveyed to decision makers and how did it affect the project?

The project brief created at the beginning of the Public Outreach and Engagement Plan, along with the evaluation conducted at the end of the plan, provides the information needed to complete this report back to the community at the end of each project phase. All stakeholders engaged in the process should receive this summary report, which completes the "feedback loop" described in the Public Outreach and Engagement Requirements.

Tips for Developing a Public Outreach and Engagement Plan

The SFMTA established our Public Outreach and Engagement Requirements to ensure that project teams are thoughtful in their approach to working with the communities we serve. This section offers general guidance to help you think about your Public Outreach and Engagement Plan. These tips do not correspond directly to the planning steps outlined in the Template. Instead, they emphasize that the development of your plan is not a mechanical process, but is instead an iterative and reflective effort.

Tip 1: Determine the Kind of Plan the Project Requires

The SFMTA's Public Outreach and Engagement Requirements mandate that every SFMTA project must have a Public Outreach and Engagement Plan. For the purpose of this requirement, a "project" is defined as, "A one-time effort to construct, acquire, replace, improve, expand, or rehabilitate the transportation system in the City and County of San Francisco." The assumption is that "one-time" includes projects that occur in multiple phases. In cases where the distinction between a "project" and "operations" is not clear, the key question is whether the agency's action impacts the public. If there are community impacts from an action, then the agency should plan for some level of public outreach and/or engagement.

If a project needs a plan, the first question to address is whether the project team needs to create a new, customized Public Outreach and Engagement Plan, or whether this is a smaller, routine project that can use a template developed within each Division. POETS refers to the latter as a **Programmatic Public Outreach and Engagement Plan**. The kinds of projects that are appropriate for Programmatic Plans are determined by each Division, and each Division is responsible for developing a Programmatic Plan for each category of projects. Examples might include stop signs or signal adjustments. Every small project must still consider community impacts, but the Programmatic Plan can be used as a template for each project that falls within the program category. The Programmatic Plan should be on file with POETS, and if so,

individual projects in the program category do not need to file separate plans (e.g., there's one Programmatic Plan on file for stop sign changes, so it's not necessary to file a separate plan for every stop sign change).

In addition to determining the kind of plan your project requires, it is essential to determine WHO needs to be involved in the development of the plan. Planning for outreach and engagement is not a solitary exercise in the office, but instead should involve collaboration among a team of staff members (and any consulting members of the team), informed by conversations with SFMTA colleagues, key community stakeholders, partner agencies, and decision makers. Given all the information and judgements that are necessary to create a Public Outreach and Engagement Plan, one of the first steps in planning is to identify who should be part of the process.

Tip 2: Scale the Plan to Fit the Project

The Public Outreach and Engagement Plan should be appropriate to the scale of the project. Plans for large projects will be detailed and complex, while those for smaller, simpler projects can be more standardized, as described above. The templates are designed to be helpful for all projects regardless of their size, and they are intended to be flexible. If the Project Needs Assessment determines that project impacts are minimal or that there is no opportunity for public influence, then the purpose of the plan might only be to inform stakeholders. On the other hand, even the simplest project might offer some opportunity for public influence.

Tip 3: Begin Outreach and Engagement as Early as Necessary

Planning for outreach and engagement should always begin as early as possible, ideally at the conceptual or pre-planning phase of a project. This does not necessarily mean that public outreach should be the first step in project implementation, only that an early Project Needs Assessment should identify WHEN is the best time to begin outreach and engagement with the public. In general, opportunities for the public to provide input on a project are greater during the early stages of a project (versus during post-legislation or construction). However, it can be counterproductive to reach out to the public too early, before relevant questions are addressed in the Project Needs Assessment (scope of the project, decision space, etc.). You get one chance to make a first impression, so it is critical to be prepared before going to the community. The point is to begin planning for public outreach and engagement at the outset of the project, and to include early outreach to key stakeholders in the plan whenever appropriate.

From the stakeholder's standpoint, "early" generally means before key decisions have been made, and in time for the public to have meaningful input on the project to the extent possible.

Realistic planning for outreach and engagement also includes early consideration of funding. As a practical matter, the Project Needs Assessment must be done soon enough to estimate the budget for outreach and engagement before the plan is fully developed. The POETS team can help with budget estimates.

Tip 4: Coordinate with Other SFMTA Projects and City Partners

The Project Needs Assessment identifies stakeholders, including those who will work on the project within the SFMTA and the city of San Francisco. When planning for public outreach and engagement for your project, it is important to know which other teams within the SFMTA might be working in the same geographic area. Project teams working in the same community should connect with one another as early as possible to share information, formulate communications strategies, and coordinate activities in a way that facilitates community understanding and input opportunities for intersecting projects.

> "Nobody cares if it's MTA or PUC or DPW. To us, it's the city."
>
> - Stakeholder Feedback

It is also essential to think forward about all phases of the project during initial planning. It is common for a project to be handled by different SFMTA divisions at different phases, or for a project to be handed off by the SFMTA to another agency (e.g., Public Works, Public Utilities Commission) at some phase. In either case, it is essential to coordinate with those agency and city partners to maintain a consistent standard of outreach and engagement, even if the SFMTA is not the lead during a particular phase of the project. From the community point of view, it doesn't matter which agency is working on a particular phase of a project. If it was seen as an SFMTA project from the beginning, then the SFMTA will be held responsible for how the project is carried out.

Tip 5: Comply with Language Access Requirements

As a city department that receives federal funding, the SFMTA must follow both local rules (San Francisco's Language Access Ordinance) and federal rules (Title VI of the Civil Rights Act of 1964 and supporting guidance) regarding accessibility to our programs and services to ensure that all customers, regardless of their ability to read, speak, write and understand English ("limited-English proficient" or "LEP"), are informed and able to participate in our agency's decision-making processes. The SFMTA's 2016 Language Assistance Plan (LAP) details the agency's policies about providing both written (translations) and verbal (via interpreters or bilingual employees) language assistance for our limited-English proficient customers and other stakeholders.

The Language Assistance Plan includes maps detailing concentrations of limited-English proficient communities by language, which can be used as a resource when determining the language needs of those who are affected by the project. In general, and at a minimum, most public information pieces should be translated into Chinese, Spanish and Filipino (Tagalog), and all public communications and meeting notices must include the 311 "Free Language Assistance" tagline (included in the Public Outreach and Engagement Plan Guide). Public meeting and hearing notices and agendas, including those posted at SFMTA.com, must include the four-language 48 hours' notice and a staff member's phone number to request language assistance; LanguageLine telephonic interpretation services can be used to process requests from limited-English proficient customers via phone. The Appendix includes a LanguageLine reference sheet, all language assistance taglines, and tips for providing language assistance. Depending on content, transit related public information pieces might require additional translation support.

The agency provides resources and training to assist with language assistance. Specific questions and requests for individual consultation or staff training should be directed to SFMTA Regulatory Affairs Manager Kathleen Sakelaris at Kathleen.Sakelaris@sfmta.com or 415.701.4339.

Tip 6: Make Outreach and Engagement Accessible and Equitable

All activities outlined in the Public Outreach and Engagement Plan must be implemented in a way that is inclusive and equitable. Activities should include methods for soliciting feedback that meet communities on their own terms, and that are accessible to youth, seniors, people with disabilities, and underrepresented community members, regardless of ability. The goal of the SFMTA is to inform anyone affected by our projects about their benefits and impacts, and to include anyone in the public process who has an interest in participating. The purpose of making communications and meetings accessible is not to "check a box," but to ensure that opportunities for public participation are open to all.

All communication materials should be provided in accessible formats. As noted above, the Appendix provides guidance on making meetings accessible. For assistance on making your materials and meetings accessible, contact Annette.Williams@sfmta.com or 415.701.4444.

The Muni Service Equity Strategy takes a neighborhood-based approach to address disparities on transit routes that are most critical to people from low-income households and people of color. As of 2018, there are eight neighborhoods covered by the Equity Strategy: Bayview, Chinatown, Mission, Tenderloin/SOMA, Oceanview, Outer Mission/Excelsior, Visitacion Valley, and Western Addition. Project teams working in any of the neighborhoods named in the Equity Strategy should review the documents at the link above and think carefully about how to apply the strategy to their own projects.

Regardless of whether your project falls within these eight neighborhoods, your Public Outreach and Engagement Plan should have a strategy to include those community members who have historically been underrepresented in the planning and decision-making process. While it may be more difficult and require more resources to reach and engage members of these communities, it is essential to make a deliberate effort to do so. The agency offers resources and support to help you plan for inclusive, equitable and accessible outreach and engagement.

"Public Participation" refers to the role of community members in planning and decision-making processes. It involves a two-way relationship in which the agency consults the public.

"Outreach" refers to agency efforts to inform stakeholders about the project and opportunities to participate in the public process.

"Engagement" refers to the agency's strategy to encourage public participation and consider public input.

Tip 7: Be Thoughtful about Stakeholder Notification

The goal of outreach and engagement is to be inclusive and equitable. Consider the full range of stakeholders who might be impacted by, or interested in, the project. As a general rule, it is advisable to expand rather than limit the geographic scope of project notification and updates, and to consider non-geographically defined communities that might also have an interest in the project. In cases where notification is legally required within a specified distance, consider doing outreach beyond the minimum legal requirement if indicated by the Project Needs Assessment.

One of the most consistent messages we have heard from community members is that notification should not be limited to the immediate neighborhood in which a project is taking place. Residents and other stakeholders in surrounding neighborhoods can be affected in sometimes unanticipated ways, so it is always advisable to err on the side of doing wider notification and outreach.

Tip 8: Plan for Outreach during Detailed Design and Construction

It is critical to maintain ongoing communication across all phases of the project, including those periods when there are no public meetings or legally required notices. Most large projects face a period between legislation and construction when the project has been approved but construction has not yet begun. Often, this phase can take years and can result in the community not knowing or understanding that the project has been even been approved, let alone that it is going to be implemented after a period of inactivity. In such cases, when construction begins, community members can be caught unaware. The approval process may be a distant memory for those who were involved, and newer residents may feel alarmed that they did not have an opportunity to participate during the early project phases.

For this reason, the Public Outreach and Engagement Plan must include a strategy to keep the public informed during these "quiet" or "inactive" periods. Examples of plans specifically tailored to the detailed design phase of a project can be found in the Appendix.

Tip 9: Consider Opportunities to Expand Engagement

There is always an obligation to inform the public about a given project. But despite the temptation to think our work ends here, it is rare that our only obligation is to inform through one-way communication. In almost every case, there is also an opportunity to engage stakeholders more deeply on some aspect of the project and to consider how public input might affect the project. Even during construction, there might be choices about sequencing, scheduling or mitigation that stakeholders can influence. While the minimum goal is always to inform the public about a project, good practice requires thinking carefully about how the "decision space" for public influence can be defined and potentially expanded at each phase of the project's delivery. The next section on the "Spectrum of Public Participation" provides a framework for thinking about decision space.

Tip 10: Update the Plan between Project Phases

The Public Outreach and Engagement Plan should lay out a strategy for the life of the project, with the understanding that the plan will be reviewed and updated at the end of each phase based on lessons learned and changing conditions. As a general rule, it is advisable to update the Public Outreach and Engagement Plan approximately every six months, even if a project phase lasts longer.

The Public Outreach and Engagement Requirements call for documentation of the how the Public Outreach and Engagement Plan was implemented. The templates for creating the Public Outreach and Engagement Plan provide space to record whether the plan was implemented as expected during a particular phase, the lessons learned, and the recommended revisions to the plan going forward.

The Spectrum of Public Participation

A key step in developing the Public Outreach and Engagement Plan is identifying the purpose of public participation at each phase of the project. Is the purpose simply to inform stakeholders, or is it also to ask for public feedback that might shape the project? Public participation practitioners refer to this as the project's **Decision Space.** To what extent can the public influence the project? What has already been decided, and what is on the table for consideration? The SFMTA makes a commitment about how public participation can influence each of our projects. Defining the "decision space" gives the community clear expectations about the purpose of public participation and helps planners understand how public input that can potentially influence the project.

The SFMTA has worked closely with the International Association of Public Participation (IAP2), whose **Spectrum of Public Participation** is a useful framework for helping to think about the decision space for a project. The Spectrum defines the project sponsor's commitment to public participation during each phase of project delivery. Once the goal of public participation has been defined, the Spectrum helps the project team choose the outreach and engagement methods that are appropriate for the project. The agency can reach out to stakeholders just to inform them about a project, or also to engage them in higher levels of participation along the Spectrum. Any level of public participation beyond "inform" requires some level of "engagement" by the agency in addition to communications "outreach."

The figure below defines four levels of public participation on the IAP2 Spectrum and suggests methods that correspond to each level. It is important to note that the correspondence between the level of participation and the methods used is suggestive rather than definitive. Different methods can be used for different purposes. For example, while we have heard from our stakeholders that "open houses" are forums for staff to speak, and "town halls" are opportunities for the public to speak, it is certainly true that staff can listen and take valuable feedback at open houses. Similarly, a walking tour or an ambassador can be methods to inform and/or involve the community in planning for a project.

THE SPECTRUM OF PUBLIC PARTICIPATION

The following levels of participation describe different roles of the public in the planning and decision-making process, and the commitment made by the agency at each level. The agency's outreach and engagement strategy should correspond to the goal of public participation at each project phase.

LEVEL →	INFORM	CONSULT	INVOLVE	COLLABORATE
Goal of Outreach and Engagement	We will keep you informed about the project and the decision-making process.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the project and decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the project and decision.	We will look to you for advice and innovation in formulating solutions, and we will incorporate your advice and recommendations into the project and decision to the maximum extent possible.
Example Tactics	• Open house • Newsletter • Webpage • Factsheet • Email • Social media • Mailer • Poster • Phone hotline • Ambassador	• Town hall • Public meeting • Comment form • Survey • Focus group • Interview • Tour • Pop-up booth	• Workshop • Charrette • Deliberative poll • Recurrent conversations	• Advisory committee • Participatory budgeting • Collaborative problem-solving • Small group dialogue

Adapted from the International Association for Public Participation (IAP2)

The spectrum is helpful in thinking about the purpose of public outreach and engagement at different phases of a project. Typically, there is more decision space – more opportunity for meaningful public input – at earlier stages of a project (although, as noted above, even the construction phase generally allows some room for public input, even if it is more limited than at earlier phases).

At the same time, if outreach occurs too early, the project might not be well defined, and it might not be clear to the public how to provide input. The key is to think carefully about the goals of public outreach and engagement, and to time the work appropriately. It is critical for the Public Outreach and Engagement Plan to allow enough time to inform and/or engage the public before legal milestones for public comment are reached and decisions are made.

Division 9 – Exhibit B
Public Outreach and Engagement Plan Template

Public Outreach and Engagement Plan Template

Follow the steps below to create the Public Outreach and Engagement Plan for your project. See the Public Outreach and Engagement Plan Requirements for the standards that every plan must meet, and the Public Outreach and Engagement Plan Guide for more detailed support on completing each step of the plan. When you complete the plan, submit it to the POETS page on the SFMTA intranet here. **THIS STEP IS MANDATORY**. **Keep in mind that your plan is a public document and may be reviewed by SFMTA leadership and staff, city partners and members of the public.**

Project Overview

INSTRUCTIONS: Create an initial summary of the project scope, purpose, benefits and timeline. Based on an initial understanding of the project, state the anticipated decision space – the aspects of the project that the public might be able to influence and those that cannot be changed. Note that this is a very early step in project planning and should be revised based on the subsequent Project Needs Assessment. As a general rule, the Project Overview should fit on one page. Maps or other graphics can be included on the reverse side, but the Project Overview should be a single sheet when printed.

Project Description

Click here to enter text.

Project Purpose

Click here to enter text.

Project Benefits

Click here to enter text.

Project Start and End Dates

Click here to enter text.

Decision Constraints (What has already been determined or decided?)

Click here to enter text.

Project Needs Assessment

STAKEHOLDER ANALYSIS

INSTRUCTIONS: Use this table to identify stakeholders – those who will be affected by, or interested in, the project. Check the categories of stakeholders who will be affected by the project, list specific individuals and groups, and classify each as either primary, secondary or partner audiences. Note that where boxes are already selected there is a presumption that these categories of stakeholders will be included in most plans. To the extent possible, classify each group as "primary," "secondary," or "partner." Primary stakeholders are *directly* impacted by the project and must be informed regularly (e.g., residents, merchants). Secondary stakeholders are *indirectly* or *temporarily* impacted by the project (e.g., delivery drivers, commuters, tourists). Partner stakeholders are *influential and interested* within the project area and/or community-at-large (e.g., transit riders, bicycle advocates). Partners can affect awareness and support and may be enlisted to assist with outreach to the primary and secondary audiences and/or to champion the project.

Stakeholders Who Reside, Work or Travel through the Project Area

✓	**Category:** Type of Stakeholder	**Names:** Specific Individuals or Groups	**Classification:** Primary, Secondary, Partner
☒	Residential Area	Click here to enter text.	Choose an item.
☒	Business District	Click here to enter text.	Choose an item.
☒	People who drive	Click here to enter text.	Choose an item.
☒	People who walk	Click here to enter text.	Choose an item.
☒	People who ride bicycles	Click here to enter text.	Choose an item.
☒	People who ride transit	Click here to enter text.	Choose an item.
☐	Other	Click here to enter text.	Choose an item.

Community Organizations Located in the Project Area

✓	**Category:** Type of Stakeholder	**Names:** Specific Individuals or Groups	**Classification:** Primary, Secondary, Partner

☒	Neighborhood Organizations	Click here to enter text.	Choose an item.
☒	Merchant Groups	Click here to enter text.	Choose an item.
☒	Community Groups	Click here to enter text.	Choose an item.
☐	Interest/Advocacy Groups	Click here to enter text.	Choose an item.
☐	Faith-Based Groups	Click here to enter text.	Choose an item.
☐	Schools	Click here to enter text.	Choose an item.
☐	Senior Centers, Disabled Services	Click here to enter text.	Choose an item.
☐	Media (local and citywide)	Click here to enter text.	Choose an item.
☐	Other	Click here to enter text.	Choose an item.

Internal Stakeholders and Influencers

✓	**Category:** Type of Stakeholder	**Names:** Specific Individuals or Groups	**Classification:** Primary, Secondary, Partner
☒	SFMTA Internal Stakeholders (other projects that intersect with yours)	Click here to enter text.	Choose an item.
☐	SFMTA Board of Directors	Click here to enter text.	Choose an item.
☐	San Francisco Board of Supervisors	Click here to enter text.	Choose an item.

☐	Local Elected Officials (Supervisorial District)	Click here to enter text.	Choose an item.
☐	City Agencies (Public Works, Public Utilities Commission, Planning, Police, etc.)	Click here to enter text.	Choose an item.
☒	SFMTA Committees (Citizens' Advisory Council, Multimodal Accessibility Advisory Council, Paratransit Coordinating Council)	Click here to enter text.	Choose an item.
☒	Planning/Funding Organizations (County Transportation Authority, Metropolitan Transportation Commission, etc.)	Click here to enter text.	Choose an item.
☐	State and Federal Elected Officials (Delegation offices)	Click here to enter text.	Choose an item.
☐	Local schools and district	Click here to enter text.	Choose an item.

IMPACT AND INTEREST ANALYSIS

INSTRUCTIONS: Think about the ways that the project will affect residents, merchants, those who ride transit, and those who walk and ride bicycles on city streets. List the main impacts anticipated throughout all phases of the project. Note that the impacts identified in your plan are distinct from those detailed in an Environmental Impact Report or Environmental Impact Statement. While those documents might inform your analysis, the focus here is impacts on the local community.

After listing the project impacts, use the following table

Impact and Interest Analysis Calculation

to calculate a score that represents the overall level of impact and interest. There is no hard and fast rule for translating the score into a particular plan, but it is an indicator of the public's likely expectations around outreach and engagement. It is intended to serve as a starting point for discussion among the project team in developing the Public Outreach and Engagement Plan.

To find your project score, answer each question by putting a number 1 in the appropriate box in each row. The table will add the numbers in each column and then multiply the total in each column by the column weight (very low = 1, low = 2, moderate = 3, high = 4, very high = 5). The table will then calculate an average score across all questions. Write the impact and interest analysis average score below.

Impact and Interest Analysis Average Score: Click here to enter text.

Project Impacts

List the main impacts anticipated from the project (service changes, traffic changes, parking changes, construction, etc.)

Click here to enter text.

DECISION SPACE ANALYSIS

INSTRUCTIONS: Describe the decision space of the project (the scope of potential public influence on the project or decision and the opportunities for public participation). Public participation requires the SFMTA to make a commitment to stakeholders about their involvement in the project. Defining the decision space gives the public clear expectations about their role in the planning and decision-making process. Complete the section below to identify the aspects of the project that the public can potentially influence, and the kind of public input that the project team will seek. See the Guide for a discussion of how the score on the impact and interest analysis can inform the decision space analysis.

What aspects of the project can potentially be influenced by public input?

Click here to enter text.

What aspects of the project are NOT open to change based on public input, and what are the constraints that limit public influence (financial, legal, legislative, etc.)?

Click here to enter text.

Goals and Objectives

INSTRUCTIONS: List the goals and objectives of the Public Outreach and Engagement Plan for each phase of the project that the plan covers. Goals should correspond to the levels of public participation on the Spectrum of Public Participation (Inform, Consult, Involve, Collaborate). Objectives should be measurable indicators of the extent to which the goals are met. Indicate the data sources that will be used to measure progress on the objectives.

PROJECT PHASE: Click here to enter text.

GOAL / OBJECTIVE	DATA SOURCES
Goal #1 Click here to enter text.	Click here to enter text.
Objective 1.1 Click here to enter text.	Click here to enter text.
Objective 1.2 Click here to enter text.	Click here to enter text.
Goal #2 Click here to enter text.	Click here to enter text.
Objective 2.1 Click here to enter text.	Click here to enter text.
Objective 2.2 Click here to enter text.	Click here to enter text.

Key Messages

INSTRUCTIONS: List the key messages about the project for general and specific audiences. Be sure to include the purpose and benefits of the project, potential impacts, project timeline, opportunities for

public input, and key contacts. Where relevant, indicate the intended purpose of communication in relation to the goals of the Public Outreach and Engagement Plan (to inform, to recruit participants, etc.).

Messages for General Audience:

Click here to enter text.

Specific Audience Messages (Stakeholder: Click here to enter text.**)**

Click here to enter text.

Specific Audience Messages (Stakeholder: Click here to enter text.**)**

Click here to enter text.

Specific Audience Messages (Stakeholder: Click here to enter text.**)**

Click here to enter text.

Specific Audience Messages (Stakeholder: Click here to enter text.**)**

Click here to enter text.

Outreach and Engagement Techniques

INSTRUCTIONS: List the outreach and engagement techniques and tools you will use to achieve the goals and objectives you established for the project. Include multi-channel communications tactics, community meetings, and other ways you will reach out to stakeholders given your goals for each project phase. This step is about how to inform and engage the public, including details about implementation. This is also the appropriate step for planning language access needs.

Project Phase: Click here to enter text.

ONGOING (For communication and relationship-building throughout the phase)

Click here to enter text.

DISCRETE (At specific points to inform, compile feedback or convene people)

Click here to enter text.

Project Phase: Click here to enter text.

ONGOING (For communication and relationship-building throughout the phase) Click here to enter text.
DISCRETE (At specific points to inform, compile feedback or convene people) Click here to enter text.

Project Phase: Click here to enter text.

ONGOING (For communication and relationship-building throughout the phase) Click here to enter text.
DISCRETE (At specific points to inform, compile feedback or convene people) Click here to enter text.

Schedule and Responsibilities

INSTRUCTIONS: Create an action plan – a summary of the schedule and responsibilities for public outreach and engagement activities and tasks.

PUBLIC OUTREACH & ENGAGEMENT ACTION PLAN

Date	Activities/Tasks	Person(s) Responsible
Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose "Remove Content Control".	Click here to enter text.	Click here to enter text.
Click down arrow to enter	Click here to enter text.	Click here to enter text.

a date; to enter approx. date or range, click inside cell, right click & choose “Remove Content Control”.		
Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose “Remove Content Control”.	Click here to enter text.	Click here to enter text.
Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose “Remove Content Control”.	Click here to enter text.	Click here to enter text.
Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose “Remove Content Control”.	Click here to enter text.	Click here to enter text.

Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose "Remove Content Control".	Click here to enter text.	Click here to enter text.

Budget

INSTRUCTIONS: Enter the estimated budget for public outreach and engagement for each project phase that the Public Outreach and Engagement Plan covers. Note: depending on the project, it might be necessary to complete this estimate before other steps in the planning process. If possible, however, the budget will be based on the Project Needs Assessment and a thorough understanding of the strategy for outreach and engagement. Note that the table below represents a budget summary which should be based on a more detailed estimate of budget line items for each phase. Note that budgeting for public outreach and engagement is more art than science and must be conducted on a project-by-project basis. Division Leads can provide support in developing your budget. The Appendix provides examples of line item budgets for other SFMTA projects.

PUBLIC OUTREACH & ENGAGEMENT PLAN BUDGET

Project Phase: Click here to enter text.	
Project Phase: Click here to enter text.	
Project Phase: Click here to enter text.	
Project Phase:	

Click here to enter text.	
TOTAL	$ 0.00
Enter cost for each phase; to total, click the $ sign and press F9. If you make changes to any of the costs, click the $ sign and press F9 to calculate the new total.	

Plan Review

INSTRUCTIONS: Check which of the following people and agencies need to be contacted and informed about your plan. Which SFMTA projects intersect with yours? What other agencies will you need to work with? Who needs to be kept informed within the City? Indicate in the Notes the nature of the relationship.

✓	Target:	Notes:
☒	SFMTA Public Relations Officer	Click here to enter text.
☒	Other SFMTA Projects in your Project Area	Click here to enter text.
☒	District Liaison for your Project Area	Click here to enter text.
☒	POETS Division Lead	Click here to enter text.
☐	Project Management Office	Click here to enter text.
☐	Other City Departments	Click here to enter text.
☐	Other non-City Agencies	Click here to enter text.

Plan Evaluation

INSTRUCTIONS: At the end of each phase of the project (or every six months, whichever comes first), answer the following questions and submit an updated version of your plan (one that includes the completed section below and any revisions to other parts of the plan for future phases of the project) to the POETS page on the SFMTA intranet here. If the Plan Evaluation along with any revisions to the Public Outreach and Engagement Plan.

Project Phase: Click here to enter text.

Was the plan implemented as intended? How did it change? Click here to enter text.
To what extent did the plan achieve its goals and objectives? Click here to enter text.
What were the main lessons learned during implementation? Click here to enter text.
How would you modify the plan as the project moves to the next phase? Click here to enter text.
How did you document public input and how it was considered (if applicable)? Click here to enter text.

Report Back to Stakeholders

INSTRUCTIONS: At the end of each phase of the project, complete the "feedback loop" with stakeholders who were contacted or engaged. Use the Template to provide the key information that will be provided to stakeholders, and to document when, how and to whom it was provided.

Project Phase: Click here to enter text.

What aspects of the project were open to public input? Click here to enter text.

What were the techniques used to receive public input? (meetings, website, surveys, etc.)

Click here to enter text.

What input did the project team receive from the public?

Click here to enter text.

How was public input conveyed to decision-makers (if applicable)?

Click here to enter text.

How did public input influence the project?

Click here to enter text.

What are next steps for the project and any opportunities for further public input?

Click here to enter text.

List the stakeholders who received a follow-up report (written or verbal):

Stakeholder	Method	Date
Click here to enter text.	Click here to enter text.	Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose "Remove Content Control".
Click here to enter text.	Click here to enter text.	Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose "Remove Content Control".

Click here to enter text.	Click here to enter text.	Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose "Remove Content Control".
Click here to enter text.	Click here to enter text.	Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose "Remove Content Control".
Click here to enter text.	Click here to enter text.	Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose "Remove Content Control".
Click here to enter text.	Click here to enter text.	Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose "Remove Content Control".

Click here to enter text.	Click here to enter text.	Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose “Remove Content Control”.
Click here to enter text.	Click here to enter text.	Click down arrow to enter a date; to enter approx. date or range, click inside cell, right click & choose “Remove Content Control”.

Division 10: SFPW Div 01 General Requirements for Construction

Table of Contents

SECTION 00 73 20 - EXISTING UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes special requirements for existing utilities and underground facilities owned or controlled by any person or entity, private or governmental, referred to herein as “Utility Owners,” which may be encountered by PPC while performing the Work.

B. Utilities in public streets that are within the jurisdiction of the Department of Public Works shall be governed by the applicable provisions of the San Francisco Public Works Code, Sections 906, 907, 908, 909, and 910. The Utility Crossings Specifications (see Section 00 73 21) are based on agreements with non-governmental agencies for removal, support and relocation of privately-owned utility facilities.

1.2 GOVERNMENTAL UTILITIES IN THE CITY OF SAN FRANCISCO

A. PPC shall satisfactorily support, work around, and protect, as approved by the City as Regulator, all Utilities, whether shown on drawings or not, which exist within any excavation and which are owned or controlled, and maintained, by a City department or Governmental Entity, including, but not limited to, traffic control, lighting, police communication and fire alarm systems, and all conduits, wiring and related appurtenances for such systems; sewers and sewer structures; water enterprise Utilities; pipes and Utilities of the Auxiliary Water Supply System for Fire Protection; the Municipal Railway and Hetch Hetchy Water and Power overhead lines and power feeder systems serving the Municipal Railway; and other Hetch Hetchy Water and Power Utilities (together, “**Governmental Utility(ies)**”).

1. If Municipal Railway facilities, Hetch Hetchy Water and Power facilities serving the Municipal Railway, and other Hetch Hetchy Water and Power facilities are encountered, PPC shall support such Utilities in a manner satisfactory to the City as Regulator.

2. If Auxiliary Water Supply for Fire Protection Utilities are encountered, PPC shall support such Utilities by a minimum of one cable with turnbuckle, a strongback, and a beam spanning the trench; however, where a joint falls within the trench area, a cable with turnbuckle shall be placed on each side of the joint. All such support work shall be subject to the approval of the City as Regulator before commencement thereof. After supports are removed and the pipe is sufficiently supported by partial backfill, but with the joints exposed, the pipe shall be subjected to a hydrostatic field test of 350 psi pressure in accordance with section 908.22 of the DPW Standard Specifications (refer to Division 1 for reference standards) before final backfill is placed. If a joint is visibly wet, PPC shall repair the joint in accordance with section 910 of the DPW Standard Specifications.

3. If vitrified clay pipe side sewers or culverts are encountered, PPC may elect, in lieu of supporting such side sewers and culverts, to cut and restore those portions of the side sewers and culverts which obstruct the prosecution of the Work, provided that PPC complies with the provision of section 301 of the DPW Standard Specifications regarding the handling and disposal of seepage, storm water and sewage.

4. Water enterprise Utilities, if encountered, shall be supported by PCC as follows:

    a. Push-on joint pipes: Pipes shall be supported by a minimum of one cable with turnbuckle, a pipe clamp and a beam spanning the trench; however, where a joint falls within a trench area, a cable with turnbuckle and pipe clamp shall be placed on each side of the joint.

b. Copper tubing and plastic pipes (service pipes 2 inches or smaller in diameter): If the trench is less than 8-foot wide, no support is required. For trenches wider than 8 feet, one support is required for every additional 8 feet or part thereof.

c. Steel welded pipes: Pipes shall be supported in a manner satisfactory to the General Manager of the Public Utilities Commission of the City and County of San Francisco.

d. PPC shall submit support designs for approval and start work only with approved support designs.

5. PCC shall perform the adjustment of manhole castings and other castings of Government Utilities, and the paving adjacent thereto, in accordance with the requirements of Section 217 of the DPW Standard Specifications.

B. Supporting, working around, and protecting existing Governmental Utilities shall be considered part of the Work.

1.3 NON-GOVERNMENTAL UTILITIES IN THE CITY OF SAN FRANCISCO

A. The procedure to be followed with respect to non-governmental Utilities owned or controlled by any person, company, firm or corporation, is covered by sections 906, 907, 908, 909, and 910 of the San Francisco Public Works Code (part II, chapter X, of the Municipal Code).

B. Principal Project Company shall be aware that agreements have been executed between various Utility Owners, and the City, enabling such Utility Owners to have included in City contracts the work of supporting, working around, and protecting their Utilities. Such work will be paid for by the various Utility Owners directly to PPC in conformance with the provisions of the Utility Crossing Specifications (Section 00 73 21). Requirements for performance of this work are also contained in the Utility Crossing Specifications.

1.4 ABANDONED UTILITIES

A. These provisions do not apply to abandoned Utilities. Any increase in the cost of PPC operations occasioned by the presence and/or removal of abandoned Utilities shall be at the sole expense of PPC and no additional payment will be made by the former Utility Operators or by the City.

1.5 USE OF PAVEMENT BREAKER ADJACENT TO UTILITY FACILITIES LIMITED

A. In accordance with the requirements of section 373 of the Public Works Code, PPC may use pavement breakers or other labor-saving devices; however, the use of any machine or device that breaks pavement by blows struck by a falling or driven hammer or weight is prohibited within a horizontal distance of 6 feet from any gas, sewer, water or Auxiliary Water Supply System pipe, communications duct or any other utility facility.

1. Such prohibition, however, shall not be construed as barring the use of hand tools or manually operated air tools such as jackhammers.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 00 73 21 - UTILITY CROSSINGS

(Effective January 1, 2023)

SECTION U1. SUPPORT, WORK AROUND, AND PROTECT EXISTING UTILITY COMPANY FACILITIES-GENERAL SPECIFICATIONS

I. General

PPC shall support, work around, and protect all existing Utilities, including the Utilities of the following Utility Owners, as applicable, where Utilties exist within excavations and interfere with the prosecution of the Work because of their presence:

Pacific Gas and Electric Company (PG&E), Pacific Bell Telephone Company D/B/A AT&T California (AT&T), Comcast Corp. (Comcast), Astound Broadband, LLC dba Wave (Astound), Webpass Telecommunications LLC (Webpass), Zayo Group, LLC (Zayo), Century Link Communications LLC f/k/a Qwest Communications Company LLC (Century), Sonic Telecom, LLC (Sonic), GTE Mobilnet d/b/a Verizon Wireless (Verizon), Mobilitie, LLC (Mobilitie), Crown Castle NG West LLC (Crown Castle), ExteNet Systems (California) LLC (Extenet). MCImetro Access Transmission Services Corp., PAXIO, INC., Electric Lighwave Holdings, Inc. fka Integra Telecom Holdings, Inc. (Electric Lightwave), Mpower Communications Corporation, T-Mobile West LLC (T-Mobile), Level 3 Communications LLC (Level 3), TW Telecom of California l.p, formerly known as Time Warner Telecom of California, L.P (TW Telecom).

This Section covers supporting documentation required from PPC and direct payment by the Utility Owner to PPC, based upon existing agreements between the Utility Owners and the City, for all costs incurred as a result of the work performed by the PPC to support, work around and/or protect the existing Utility Crossings within the Project Site.

Principal Project Company shall identify in the relevant Design Documents all known Utilities and where Utility Crossing work is anticipated. Utilities which the Utility Owner intends to adjust or abandon thus eliminating the need for PPC to support, work around, or protect will also be identified.

Within 45 calendar days of NTP 1, the Utility Owners listed above, as applicable, will execute a payment agreement with the PPC and will pay said PPC directly for the work of supporting, working around, and protecting such Utilities, according to the Fixed Price Schedule, set forth in this Section 00 73 21. The Utility Owner is not required to accept or pay invoices submitted to the Utility Owner by a Subcontractor. PPC will not be allowed to mark up the invoices for the support and work around costs from any Subcontractor.

PPC shall perform the Work at Utility Crossings of other non-governmental Utilities not owned by the Utility Owners identified in this Section 00 73 21.

Any Utilities owned by Utility Owner that require relocation to avoid physical conflict with the facilities to be constructed under this Agreement will be relocated by the appropriate Utility Owner.

Utility Crossing work that is subject to the Fixed Price Schedule is not a Utility Adjustment.

Definitions

Utility Crossing: means any Utility, including a Utility main, duct structure, or service, located within an excavation area of the Work, where the Utility will remain in place and will not be relocated, abandoned in place, or removed.

Duct Structure: means one or more ducts, conduits or pipes, of any size, or a combination of such ducts, conduits or pipes, which are grouped together but which may or may not be banded, encased in concrete, or otherwise incorporated into a solid unit.

Nested Utilities: means facilities six- inches (6") or less in outside diameter or width and are less than 3 feet clear distance from each other regardless of ownership. In the case of nested facilities, each crossing shall be paid for according to the Fixed Price Schedule reduced by 33-1/3%.

Abandoned Utilities: means those Utilities identified by the Utility Owner as Utilities that the Utility Owner has stopped using with the intent of never using again.

Inactive/Deactivated Utilities: means those Utilities that Utility Owner identifies as Utilities that Utility Owner has temporarily stopped using with the possible intent of future use.

Fixed Price Schedule

Utility Crossings where the length of the Utility is not more than 3 times the width of the excavation for excavation widths less than 18 feet, shall be priced pursuant to the "Fixed Price Schedules" set forth in this Section 00 73 21, and submitted to the Utility Owner for payment.

Excavation width will be the outside diameter or width of the City-owned structure plus 3 feet. The length of a Utility Crossing is the centerline distance, in feet, of the portion of the Utility within the excavation area.

Utility Co. Facility Support, Etc., Work Located in Contract but Utility Contract Drawings Omitted from Contract

In the event that information from the Utility Owners listed in this Section 00 73 21, as applicable, are not included in the Agreement but the cost estimate and general location of the support, work around and protect work are known and included in the Contract Documents, all such work performed will be paid for by the Utility Owner according to the Fixed Price Schedule hereinafter set forth.

Utility Co. Facility Support, Etc., Work Overlooked, Unexpected, and Not Shown on Utility Contract Drawings, but Ownership Known

Support, work around and protect work for those Utility Crossings overlooked, unexpected, and not shown on information provided by Utility Owners will be paid for by the Utility Owner according to the Fixed Price Schedule set forth in this Section 00 73 21 plus an additional fifteen (15) percent surcharge for Principal Project Company's profit and overhead.

Negotiated Payment

Notwithstanding the Fixed Price Schedules hereninafter set forth, the Utility Company and the PPC shall directly negotiate the costs for:

- "Parallel" Utility Crossings,
- Utility Crossings with lengths more than three times the width of the excavation, and/or
- Where the computed cost of any crossing exceeds **$12,748**.

If a public or private Utility is located longitudinally and directly on top of the Project trench or multiple Utilities crossing the Project trench are located too close to each other leaving no space in between for the PPC to excavate and shore the trench, and there is a need to change the construction method to install Project facilities, then the increased cost shall be shared by Utility Owners and Principal Project Company based on the number, size, and ownership of each Utility.

Abandoned or Inactive/Deactivated Facilities

Abandoned Utilities

Abandoned Utilities are those Utilities identified by the Utility Company Owner identifies abandoned facilities as facilities Utilities that they have Utility Owner has stopped using with the intent of never using again. Utility Owner may, but is not required to, specify abandoned Utilities materials it furnishes to support Utility work, including Utility Crossings. If PPC encounters unidentified Utilities during construction, PPC shall notify the Utility Owner in

accordance with paragraph “Unexpected or Unidentified Utilities”. The Utility Owner inspector shall visit the site within 24 hours or the time required in Utility contracts with the City to confirm that the Utility is abandoned. If the Utility Owner fails to confirm that the Utility is abandoned, the PPC will receive full payment per Fixed Price Schedule for support, work around and protect work performed.

Inactive/Deactivated Utilities

Utility Owner will specify materials it furnishes to PPC to support Work related to Utilities and Utility Crossing any inactive Utilities. The PPC will perform support, work around, and protect around inactive Utilities unless otherwise instructed by the Utility Owner.

Removal of Abandoned Utilities or Inactive Utilities

If necessary to construct the Project, the removal of abandoned or inactive Utilities that the Utility Owner determines it intends to abandon will be at the PPC’s sole expense, except for removal of duct banks, and conduits or pipes larger than twelve-inch (12”) in outside diameter owned by the Utility Owners. Utility Owner and the PPC will negotiate the cost for removal of such Utility Owner duct banks, and conduits or pipes larger than twelve-inch (12”) in diameter.

Payment Only for Work Performed by the PPC

The Utility Owner will not pay the PPC unless actual work to support, work around and/or protect the Utility Owner’s Utilities was performed. No payment shall be due to the PPC if the Utility Owner crews respond and are supporting, working around, and/or protecting their Utilities, such as in an emergency, or if the PPC does not actually perform any work or undertake any action to support, work around or protect the Utility Owner’s Utilities.

II. Contract Activities

Utility Crossing Measurement

The PPC shall measure the outside diameter or width of Utility Crossings to the nearest inch (outside diameter **excluding** any fittings, bells, or gate valves) and length of the Utility Crossings to the nearest foot to determine the cost of each Utility Crossing according to the Fixed Price Schedule hereinafter set forth.

Utility Company’s Right of Confirmation

The Utility Owner shall have the right to confirm measurements with the PPC but all disagreements shall be resolved without delay to the Project Schedule.

Variations and Cost Adjustments

The PPC shall notify the Utility Owner immediately of any variation of Utility Crossings from the materials furnished by the Utility to support Work related to Utility Crossings and estimate the required cost adjustment for such variations. Cost adjustments shall be settled within no more than two Days.

Verification and the PPC Itemization

PPC shall keep an itemized record of the Utility Crossing work done, noting any variations from the materials furnished by Utility Owners to support Work related to Utility Crossings and estimates. The itemized record shall be maintained and copies submitted monthly to the Utility Owner and the City for information.

Supporting Documentation for City Projects other than Spot Sewer Repair Contracts

The PPC shall, at a minimum, submit the following supporting documentation with each invoice submitted to the Utility Owner for payment:

- Utility Crossing support and work around summary and Design Documents for support and work around invoice for utilities” identifying the Utility Owner reimbursed work by type of Utility, and shall include following:

  - Identification of all Utility Crossings by alpha-numerical numbering system (e.g., E1, E2, G1, G2);
  - Location and size of all Utility Crossings
  - Length of all Utility Crossings
- Photos of following Utility Crossings:
  - Utility Crossings where the size of the Utility varies from that shown on Design Documents or estimates; any change of measurement requires one photo per block per size variation.
  - Utility Crossings not shown on Utility Owner's Utility Contract Drawings or estimates.
  - Parallel Utility Crossings showing measurements and potential facilities support
  - Utility Crossings six-fee (6') or longer unless:
    - Shown on Utility-furnished materials and/or estimates and no variance.
    - Utility is a lateral that is crossing the excavations having 6 feet or greater trench width and crossing length does not exceed the trench width.

Supporting Documentation for Spot Sewer Repair Contracts

The PPC shall, submit the following documentation with each invoice submitted to the Utility Owner for payment for spot sewer repair contracts:

- A summary of Utility Crossing support and work around.
- Support and work around invoice for Utility Crossings identifying company reimbursed work by block, type of Utility and shall include following:
  - Identification of all Utility Crossings by alpha-numerical numbering system (e.g., E1, E2, G1, G2);
  - Location and size of all Utility Crossings
  - Length of all Utility Crossings.
  - Invoice and as-built templates shall be utilized and all information filled out in its entirety (e.g. PPC representative's name and signature, date, etc.)
- Photos of following Utility Crossings:
  - All Duct Bank Structures and related measurements
  - All Utility Crossings six-feet (6') or greater in length
  - All unmarked active Utility Crossings that are supported
  - Each utility that varies in size and/or location from USA street marking(s).
- Underground service alert ticket number

Photos

All photos must include:

- Label with Utility Crossing reference number
- Name of street or intersection
- Above-ground picture that includes a landmark (street sign, or house) that helps identify location of the crossing.

Unexpected or Unidentified Utilities

If, during the course of the work, an unexpected or unidentified interference is discovered, the PPC shall immediately call this fact to the attention of all Utility Owners, including appropriate City Departments. The City Departments and Utility Owner shall have 48 hours from receipt of such notification including at least 8 working hours to determine ownership and provide direction to the PPC for disposition of the Utility which are not in direct conflict with the Work and can be supported, worked around and protected in the trench. However, if the unidentified facility is in direct physical conflict with the City Project work and the PPC cannot proceed further without resolution, the Utility Owner and City Departments will visit the site as soon as possible within the 24 hours from receipt of such notification to determine ownership and provide direction to the PPC. The time allowance shall include at least 8 working hours. If the ownership of the unidentified Utility is unknown, the PPC shall call Underground Service Alert (USA) requesting Utility Companies to visit the site to identify the ownership. If no determination can be made after the aforementioned procedure is followed, the PPC will follow the direction of the City or authorized designee to either remove the facility as abandoned or support and work around the Utility. Disposition shall be in accordance with the applicable requirements of Section 00 73 20, Article 1.3, if such Utilities are owned by Utility Owners other than the Utility Owners listed above. If ownership is by one or more of the Utility Owners listed above, disposition shall be as hereinbefore set forth under the heading, "Utility Owner Utility Support, Etc., Work Overlooked, Unexpected, and Not Shown on Utility Contract Drawings, But Ownership Known." If the City directs the PPC to support and work around a Utility whose ownership is unknown and cannot be confirmed that it is abandoned, support and work around work of such Utility will be paid for by the City according to the Fixed Price Schedule hereinafter set forth plus an additional fifteen (15) percent surcharge for PPC's profit and overhead.

Progress Payments

Progress payment for completed Utility Crossing work shall be made by the Utility Owner within ninety (90) days of receipt of an invoice from the PPC submitted along with the supporting documentation listed above.

III. METHOD OF DETERMINING UTILITY CROSSING COSTS

Fixed Price Schedule

The cost of support, work around and protection of Utility mains, duct structures and services shall be based on the outside diameter or width of said Utilities and the length of the Utility Crossing.

In the following schedules the maximum outside diameter shall mean outside diameter of pipe, conduit, service, duct or main **excluding** any fittings, bells, or gate valves, and width shall mean the distance measured horizontally across the duct structure.

Cost of Utility Crossing = Fixed Cost + Support Cost Group I: Length of Crossing less than Six (6) Feet

Maximum Outside Diameter Of Main And Service Or Width Of Duct Structure	Fixed Cost	Support Cost Per Foot of Length of Crossing
4 inches or less	**$717**	0
Over 4 inches to 20 inches	**$717 + $119** per inch over 4 inches	0
Over 20 inches	**$2,628 + $199** per inch over 20 inches	0

Group II: Length of Crossing Six (6) Feet to Twelve (12) Feet

Maximum Outside Diameter Of Main And Service Or Width Of Duct Structure	Fixed Cost	Support Cost Per Foot of Length of Crossing Over Six Feet
4 inches or less	**$916**	**$119**
Over 4 inches to 20 inches	**$916 + $127** per inch over 4 inches	**$119**
Over 20 inches	**$2,955 + $215** per inch over 20 inches	**$119**

Group III: Length of Crossing Greater than Twelve (12) Feet

Maximum Outside Diameter Of Main And Service Or Width Of Duct Structure	Fixed Cost	Support Cost Per Foot of Length of Crossing Over Twelve Feet
4 inches or less	**$1,633**	**$159**
Over 4 inches to 20 inches	**$1,633 + $143** per inch over 4 inches	**$159**
Over 20 inches	**$3,926 + $239** per inch over 20 inches	**$199**

SECTION U2. SUPPORT, WORK AROUND, AND PROTECT EXISTING PACIFIC GAS AND ELECTRIC COMPANY (PG&E) UNDERGROUND FACILITIES - STANDARD TECHNICAL SPECIFICATIONS

The requirements for supporting, working around, and protecting existing Pacific Gas and Electric Company (PG&E) underground electric, gas and steam Utilities are as follows:

For pipe and conduit in sizes up to and including 6 inches inside diameter, spans of less than 6 feet shall be considered self-supporting unless otherwise directed by the City or by the PG&E inspector through the City. Spans of 6 feet and more, but not to exceed 12 feet, shall be supported by a beam with at least one cable and turnbuckle. For spans over 12 feet, an additional cable and turnbuckle shall be installed for each additional 6 feet or fraction thereof of span. Cables and turnbuckles shall be located to support joints, valves and other fittings. Cast iron joints and valves, where encountered, shall be supported on both sides.

For pipe and conduit in sizes larger than 6 inches inside diameter, spans shall be supported by beams with cables and turnbuckles located at intervals not to exceed ten times the diameter of the pipe measured in inches, unless otherwise directed by the City or the PG&E inspector through the City. Cable and turnbuckles shall be located to support joints, valves, and other fittings. Cast iron joints and valves, where encountered, shall be supported on both sides.

Concrete-encased duct lines and/or concrete-encased steam lines shall not be considered as

self-supporting, but may be so designated by the City or PG&E inspector through the City, upon a visual examination of the concrete envelope.

Beams, cables and turnbuckles for supporting steel pipe and/or conduit shall be adequately sized to limit the deflection so as not to exceed length of span in feet divided by 360.

Length of Span in Feet

Beams, cables and turnbuckles used for supporting cast iron pipe shall be adequately sized to ensure that no deflection will occur.

Beams, cables and turnbuckles used for supporting concrete encased duct lines and/or concrete encased steam lines shall be adequately sized and spaced to ensure that no deflection will occur.

For multi-way conduits, spacers shall be placed to maintain conduit separation at point of support. 2-inch x 4-inch wood softeners shall be used with all cable slings to prevent damage to pipe, coating, wrapping or concrete encasement. However, slings supporting unreinforced concrete encased pipe must also incorporate strongbacks to prevent cracking of concrete.

PPC shall exercise due care to avoid damage to pipe and pipe coatings, wrapping or concrete encasement. To help prevent damage to gas pipelines and other PG&E underground utilities, call 811 at least two (2) working days before and up to fourteen (14) days in advance of an excavation so that all crossings can be verified. Should PPC damage or displace any PG&E facility: move to a safe location, call 911, and then contact PG&E at 1-800-743-5000 (gas and electric facilities). Repairs or replacements will be made by the PG&E.

SECTION U3. SUPPORT, WORK AROUND, AND PROTECT EXISTING PACIFIC BELL TELEPHONE COMPANY D/B/A AT&T CALIFORNIA (AT&T) UNDERGROUND UTILITIES - STANDARD TECHNICAL SPECIFICATIONS

General

The requirements for supporting, working around, and protecting existing AT&T underground Utilities are as follows:

Requirements for Supporting AT&T Ducts

A single duct spanning less than 6 feet shall be considered self-supporting unless otherwise directed by the City or by the AT&T inspector through the City.

A single duct spanning more than 6 feet shall be supported by a beam with at least one cable and turnbuckle. For spans over 12 feet, an additional cable and turnbuckle shall be installed for each additional 6 feet or fraction thereof of span. Cables and turnbuckles shall be located to support duct joints.

Duct structures consisting of 2 or more single ducts not encased in concrete and spanning more than 4 feet, shall be banded with at least 2 bands and supported by a beam with at least one cable and turnbuckle. For spans over 8 feet, an additional set of bands, cable and turnbuckle shall be installed for each additional 4 feet or fraction thereof of span. Banding of ducts shall be done in such a manner as to not distort the normal configuration of the structure.

Duct structures consisting of 2 or more single ducts, encased in concrete and spanning more than 4 feet, shall be supported by a beam with at least one cable and turnbuckle. For spans over 8 feet, an additional cable and turnbuckle shall be installed for each additional 4 feet or fraction thereof of span.

Multiple-duct structures of vitrified clay and/or concrete shall be supported for the complete width of the trench. The support shall consist of planking or beams equal in width to the width of the structure and banded to it. This structure in turn shall be supported by a beam with at least one cable and turnbuckle placed every 4 feet or fraction thereof so as to maintain the existing position and alignment of the duct structure.

Duct structures consisting of dissimilar conduit materials shall be supported in the manner applicable to the most fragile portion of the structure.

Requirements for Protecting AT&T Ducts

Single ducts shall be protected if required. This determination will be made by the City or by the AT&T inspector through the City.

Duct structures having top and bottom wood planking or encased in concrete will not require additional protection unless otherwise directed by the City or by the AT&T inspector through the City.

All other multiple duct structures, with the exception of steel pipe in good condition, shall be protected by the placement of wood planking or sheeting no less than 1/2-inch in thickness and equal in width to the width of the structure.

Damage or Displacement of AT&T Utilities

Should PPC damage or displace any AT&T owned facility, the Cable Maintenance Department of AT&T shall be notified immediately by calling 611, press Option 1, and then Option 5. Repairs or replacements will be made by AT&T.

SECTION U4. SUPPORT, WORK AROUND, AND PROTECT EXISTING COMCAST CORP. (COMCAST) UNDERGROUND UTILITIES - STANDARD TECHNICAL SPECIFICATIONS

General

The requirements for supporting, working around, and protecting existing Comcast underground Utilities are as follows:

Requirements for Supporting Comcast Corp. Ducts

A single duct spanning less than six (6) feet shall be considered self-supporting, unless otherwise directed by the Comcast engineering coordinator or the Comcast inspector, through the City.

A single duct spanning more than six (6) feet shall be supported by a beam with at least one cable and turnbuckle. For spans over twelve (12) feet, an additional cable and turnbuckle shall be installed for each additional six (6) feet or fraction thereof of span. Cables and turnbuckles shall be located to support duct joints.

Duct Structures consisting of two (2) or more single ducts spanning more than four (4) feet shall be banded with at least two (2) bands and supported by a beam with at least one (1) cable and turnbuckle. For spans over eight (8) feet an additional set of bands, cable, and turnbuckle shall be installed for each additional four (4) feet or fraction thereof of span. Banding of ducts shall be done in such a manner as to not distort the normal configuration of the structure.

Duct structures consisting of dissimilar conduit materials shall be supported in the manner applicable to the most fragile portion of the structure.

Requirements for Protecting Comcast Ducts

Single ducts shall be protected if required. This determination will be made by the Comcast engineering coordinator or by the Comcast Corp. inspector, through the City.

Duct Structure having top and bottom wood planking will not require additional protection unless otherwise directed by the Comcast engineering coordinator or the Comcast Corp. inspector through the City.

All other multiple duct structures shall be protected by the placement of wood planking or sheeting no less than 1/2-inch in thickness and equal in width to the width of the structure.

Damage or Displacement of Comcast Facilities

Should PPC damage or displace any Comcast owned facility the proper authorities shall be notified immediately by calling 1-888-824-8399. Repairs or replacements will be made by Comcast

SECTION U5. SUPPORT, WORK AROUND, AND PROTECT EXISTING MUNI TRANSIT POWER (MTP) UNDERGROUND FACILITIES - STANDARD TECHNICAL SPECIFICATIONS

General

The requirements for supporting, working around, and protecting existing Muni Transit Power (MTP) underground conduit and ducts are as follows:

Requirements for Supporting MTP Conduits and Ducts

Steel conduit spanning less than six feet shall be considered self-supporting unless otherwise directed by the City or by the MTP inspector through the City.

Steel conduit spanning six feet and more shall be supported by a beam with at least one cable and turnbuckle. For spans over 12 feet, an additional cable and turnbuckle shall be installed for each additional six feet or fraction thereof of span. Cables and turnbuckles shall be located to support duct joints.

Beams, cables and turnbuckles for supporting steel conduit shall be adequately sized to limit the deflection so as not to exceed length of span in feet divided by 360.

Spacers shall be placed between multiple conduits in a manner to maintain conduit separation at points of support.

Concrete-encased ducts spanning more than four feet shall be supported by a beam with at least one cable and turnbuckle. For spans over eight feet, an additional cable and turnbuckle shall be installed for each additional four feet or fraction thereof of span for the complete width of the excavation.

Beams, cables and turnbuckles for supporting concrete-encased duct lines shall be adequately sized and spaced to insure that no deflection will occur.

PPC shall provide adequate support and protection to prevent differential movement at the juncture of manholes and duct banks.

Duct structures consisting of dissimilar conduit materials shall be supported in the manner applicable to the most fragile portion of the structure.

Requirements for Protecting MTP Conduits and Ducts

Steel conduit shall be protected if required. This determination will be made by the City or by the MTP inspector through the City.

Duct structures having top and/or bottom wood planking or encased in concrete will not require additional protection unless otherwise directed by the City or by the MTP inspector through the City.

All other duct structures, such as unprotected tile and the like, shall be adequately protected by the placement of wood planking or sheeting no less than 1/2-inch in thickness and equal in width to the width of the structure. The top, bottom and sides shall be covered as necessary, depending on PPC's operations and the conditions of the work.

Damage or Displacement of MTP Facilities

Should PPC damage or displace any MTP-owned facility, John Orkes, Overhead Lines Superintendent of the Traction Power Group (TPG), shall be notified immediately by calling 1-415-554-9221. Repairs or replacements will be made by MTP.

Conduits to Pole Risers to be Considered as Services

For the purpose of payment, conduits that run directly from a manhole or pull box to a pole riser shall be considered to be a service and will be paid for according to the Cost of Utility Crossing Schedule above (III. METHOD OF DETERMINING UTILITY CROSSING COSTS).

END OF SECTION

SECTION 01 12 00 - SPECIAL INSTRUCTIONS

PART 1 - GENERAL

The following conditions apply to the Work / Project.

A. Principal Project Company shall comply with Article 37 of General Order 95 of the Public Utilities Commission State of California. CAL OSHA regulations require that any equipment that moves vertically must maintain a 10 feet radial clearance, and any other equipment must maintain a 6 feet clearance from SFMTA overhead electric wires. The Principal Project Company shall observe these regulations during the entire duration of the construction work. The Principal Project Company shall choose the appropriate construction means and methods to meet all CAL-OSHA rules and regulations while accommodating MUNI's operational and facility's requirements.

B. Relocating or isolating/re-energizing MUNI overhead wires will not be allowed for roadway related work, which includes, but is not limited to curb ramps, curbs, gutters, sidewalk, parking strips, paving, and adjustment of castings.

C. Initial Curb Ramps: The Principal Project Company shall complete the construction of the initial curb ramps at two curb returns and have them inspected and approved by the City as Regulator prior to proceeding with construction of the other curb ramps. No additional curb ramps shall be constructed until the City as Regulator has approved the initial curb ramps. Inspection will include workmanship, color, finishes, and to verify that the curb ramps conform to the plans and specifications. The approved initial curb ramps shall be a standard of comparison for all curb ramps work.

D. The Principal Project Company shall ensure that the existing fire hydrants on site are not removed or relocated prior to curb ramp layout. The existing fire hydrant and flange shall be removed prior to final curb ramp or concrete finishing.

E. The Principal Project Company shall ensure there is proper coordination of new fire hydrant and water meter box locations with new curb ramp construction locations, so that new fire hydrants and water meter boxes do not negatively impact the curb ramp design requirements in accordance with SFDPW Standard Plans 102,854 thru 102,864.

F. The Principal Project Company shall use proper equipment to prevent unnecessary damage to public and private property not otherwise part of the Project or identified as part of the Work such as no heavy equipment on the top of sidewalks.

G. The Principal Project Company shall use temporary hot mix asphalt concrete to provide longitudinal and/or transverse transitions with a slope of 1:18 between the newly constructed concrete base, manhole, etc. and existing pavement (whenever the difference in the grade of the pavement and the concrete base, manhole, etc. exceeds 3/4 inch) by the end of the work shift or before opening the lanes to traffic. Temporary hot mix asphalt paving shall conform to Section 211.01 of DPW Standard Specifications. Installing and removing temporary paving shall be considered incidental work.

H. Five (5) working days prior to the commencement of Construction Work, Contractor shall notify Mark Middleton of the San Francisco Public Utilities Commission at (415) 262-2144 or (415) 254-3538 to schedule removal of flow meters installed in sewer manholes, if encountered within the work scope.

1. Three days (3) after completion of sewer work, Principal Project Company shall contact Mark Middleton for PUC to reinstall flow meters at affected locations.

THIS APPLIES TO THE REMOVAL OF EXISTING BUS SHELTERS AND INSTALLATION OF NEW BUS SHELTERS AND CORRESPONDING ELECTRICAL CONDUITS WITH CLEAR CHANNEL.

I. The Principal Project Company shall coordinate all bus shelter work with SFMTA and Clear Channel. Clear Channel will coordinate the removal of existing bus shelter with Principal Project Company in order to minimize bus shelter down time. Principal Project Company shall verify the new bus shelter locations with Clear Channel on site. After demolition and removal of the existing concrete pavement, Principal Project Company shall allow a maximum of five (5) working days for Clear Channel to install the underground electrical conduits and pull boxes at each bus shelter location. Principal Project Company is to contact Clear Channel and SFMTA for the new bus shelter installation after sidewalk construction has been completed.

J. If completion of the Work will require temporary closure of the roadway, such closure shall be coordinated so that neighbors are as minimally impacted as possible in multiple phases of construction.

K. Principal Project Company shall coordinate with Recology for neighborhood garbage collection at the Project Site.

L. Principal Project Company shall coordinate with neighbors and the City's Authorized Representative to allow for ingress and egress to properties during construction.

M. Contractor shall not have more than 0.5 acres open with active construction at any one time in the public right-of-way.

N. Contractor shall notify the SFMTA Meter Shop ten (10) business days prior to demolition work in areas with parking meters and once parking areas are reopened to the public.

O. Contractor shall notify the MTA Meter Shop ten (10) business days in advance of new concrete sidewalk pours to coordinate the installation of parking meter sleeves in new concrete sidewalk areas.

P. Tree trimming, replanting and removal shall be coordinated with BUF (Bureau of Urban Forestry). Provide ninety (90) calendar day notice. Tree removal or relocation shall require a permit application and fee to BUF.

Q. Contractor shall notify owners of sub-sidewalk basements in writing at least 30 days prior to performing any work within sub-sidewalk basements to coordinate access to the basements.

R. Only temporary overlay pavement markers shall be placed on top of the micro-surfacing finished work areas. Temporary tape traffic striping may be placed in areas after the permanent striping has been removed. Temporary tape traffic striping shall be removed before the area has micro-surfacing work performed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 13 00 - OVERHEAD CONTACT SYSTEM (OCS) ISOLATION AND REPLACEMENT

PART 1 - GENERAL

1.1 OVERHEAD CONTACT SYSTEM (OCS) ISOLATION

A. Principal Project Company shall perform, but not be limited to, the following tasks to complete OCS isolation work:

1. Traffic control work for de-energization and re-energization related to OCS isolation work;

2. Preparing A site specific work plan (SSWP);

3. Attend all necessary safety training and be certified by SFMTA as required before starting said work;

4. Principal Project Company shall sign a SFMTA Safety Training Waiver for OCS de-energization with respect to the safety training;

5. Obtain approval of submittals and clearance permit from SFMTA Operations Control Center (OCC) before beginning said work. SFMTA OCC permit application procedure will be discussed as part of the SFMTA safety training;

6. support during de-energization and re-energization of OCS (isolation of OCS) including support regarding installation and removal of sectional insulators; and

7. Perform all related and incidental work required for the isolation of wires in accordance with Technical Requirements and General Order 95 Cal-OSHA requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 OVERHEAD CONTACT SYSTEM (OCS) REMOVAL

A. Principal Project Company shall complete all scope of work as shown in the SFMTA approved OCS disconnection, cut, salvage-in-place, and removal plan.

B. Principal Project Company shall complete all scope of work as shown in the SFMTA approved new OCS replacement, installation, and re-energization plan.

END OF SECTION

SECTION 01 14 00 - ARTWORK COORDINATION

PART 1 - GENERAL

1.1 DEFINITIONS

A. San Francisco Arts Commission (Arts Commission) shall mean the Charter-established City agency that has jurisdiction over all art belonging to the City and charged with the preservation and care of this Artwork.

B. San Francisco Arts Commission Public Art Program shall mean the department responsible for the commissioning of permanent public Artworks to be accessioned into the Civic Art Collection as required by the City's Art Enrichment Ordinance.

C. Artist shall mean a person that designs the Artwork and consults on its fabrication and installation through a separate contract with the City, under the supervision of the San Francisco Arts Commission.

D. Artwork shall mean:

1. Artist-designed graphics integrated into the architectural glazing of the bus ramp on 17th Street measuring approximately 11,000ft^2, facing Franklin Square.

2. Artist-designed graphics integrated into the architectural glazing of a multi-story stairwell measuring approximately 3,800ft^2, located on Mariposa Street at York Street.

3. Large-scale tile Artwork on building façade measuring approximately 3,000ft^2, located on 17th Street at Bryant Street.

E. Public Art Project Manager shall mean the person that represents the San Francisco Arts Commission Public Art Program.

1.2 SUMMARY

A. Section includes:

1. Requirements for installation of Artwork that has been designed for this Project under the direction of the San Francisco Arts Commission (SFAC) Public Art Program.

a. SFAC Public Art Project Manager for this Project, shall be the contact person for all aspects related to the Artwork; coordinate the work of the various artists, and shall receive copies of all communications concerning aspects of the Project Schedule that are pertinent to the Artwork, site preparation, coordination, delivery, installation, and protection of the Artwork.

b. For Tile Artwork:

1) Artwork will be produced by Artist under a separate agreement with the City/San Francisco Arts Commission.

2) Principal Project Company shall coordinate any and all work related to the installation of Artwork with the Public Art Project Manager.

c. For Glass Artworks:

1) Artwork digital files will be furnished by the SFAC Public Art Manager.

2) Principal Project Company shall coordinate all aspects of fabricating the Artwork in consultation with the SFAC Public Art Project Manager.

3) Principal Project Company shall coordinate all aspects of transportation, acceptance and handling of Artwork (e.g., Artwork crates), installation schedule and protection of Artwork, as applicable.

4) Principal Project Company shall coordinate any and all work related to installation of Artwork with the SFAC Public Art Project Manager.

d. Principal Project Company shall coordinate all aspects of acceptance, storage, transportation, and installation of Artwork including, but not limited to the following:

1) Provide the Arts Commission with shop drawings showing the field verified and hold dimensions, materials of walls where Artwork will be installed.

2) Provide Project Schedule updates to include transportation, unpacking, installation, protection, and cleaning of Artwork.

e. Principal Project Company shall coordinate all work related to installation of Artwork with the Public Art Project Manager.

B. San Francisco Arts Commission Contact Person:

1. Public Art Project Manager:

Jackie von Treskow
Senior Program Manager, Public Art
San Francisco Arts Commission
401 Van Ness Avenue, Suite 325
San Francisco, CA 94102
Telephone: (415) 252-2225
Email: jackie.vontreskow@sfgov.org

2. Artists' Contact Information:

a. TBD

C. Artwork:

1. Artworks include but are not limited to:

a. **Artwork graphics** for incorporation into of 17th Street Bus Ramp and Mariposa and York Stairwell glazing.

b. **Graphic ceramic tiles** to be installed on the building exterior.

2. For Glass Artwork:

a. Artwork shall consist of decorative glass units for installation into the building's curtain wall system.

b. Final selection of glass type to be determined through the further development of the specification via the sample review process with the artist and selected vendor.

c. All treatments must have a warranty of 10 years, without degrading of fading.

3. For Tile Artwork:

   a. Artwork shall consist of ceramic tiles for installation on the building façade.

   b. The Arts Commission shall provide and arrange for delivery of Artwork to the Principal Project Company-provided secure, weatherproof, conditioned storage site within a thirty-mile radius of San Francisco for temporary storage prior to installation by the Principal Project Company into the Infrastructure Facility as indicated on the Final Design Documents.

   c. Principal Project Company shall coordinate the receipt of Artwork, inspection, storage, field verification of site conditions, transportation from storage to project site and installation of the Artwork and related contract activity, provide services as specified in this Section, and protect Artwork during and after installation until Final Acceptance.

4. Artwork must be integrated with construction of the Infrastructure Facility and installation coordinated and scheduled to align with the work and schedule of other trades.

5. Principal Project Company shall include Artwork installation and protection as an activity in the Principal Project Company's Project Schedule based on coordination discussions during the pre-installation conference(s). Principal Project Company shall notify the Public Art Project Manager in writing of all changes in the Project Schedule related to the Artwork(s), and is responsible for contacting the Public Art Project Manager with specific installation dates for the Artwork no less than 90 days in advance of installation.

1.3 SCHEDULING

A. Principal Project Company's Project Schedule shall include the following milestones:

   1. Date of delivery of Artwork to the Project Site;

   2. Date(s) of pre-installation Conference(s)

   3. Dates of Artwork installation

   4. Date of Artwork acceptance.

B. Additional activities shall include, but not be limited to the following: pre-production, submittals, shop drawings, samples, and field inspections.

C. Upon completion of installation, inspection will be scheduled with Artist, Public Art Project Manager, Principal Project Company, and the City's Authorized Representative for final acceptance of the Artwork. If repairs to the Artwork are required, the Principal Project Company shall complete these and other punch list items before approval by Artist, Public Art Project Manager, and the City's Authorized Representative.

1.4 SUBMITTALS

Principal Project Company shall prepare and submit the following to the Public Art Project Manager, Artist(s), and City's Authorize Representative. No work shall proceed until shop drawings of the Artwork are approved by the Arts Commission and Artists:

A. Shop Drawings:.

   1. Base drawings for layout of Artwork: shall include areas receiving Artwork, incorporate field-verified finish dimensions of the overall area, locations and dimensions of openings, construction, joint layouts, descriptions of finish and structural support details. The

submitted base drawings shall be the basis for the artists to provide rough layout guidelines for the Principal Project Company to prepare final installation shop drawings indicated below.

2. Protection Plan: location and information regarding storage location for the Artwork, protection materials and necessary equipment, attachment details, and work plan to protect installed Artwork in-place until project completion.

B. Product Data:

1. Manufactured Products, including Sealants.

2. Manufacturer's specifications, recommendations, and installation instructions - including cleaning and preparation of substrates for each product to be used.

3. Protection materials and equipment.

C. Samples:

1. For Glass Artwork:

a. Minimum 12" x 12" samples to be provided.

1) Submit up to 6 initial 12"x 12" square samples to show full range of colors, details of graphics, and visual transparency. Adjustments by Artist to Artwork digital graphics files may be made by Artist in response.

2) Submit up to 6 additional 12"x12" samples based on adjusted graphics.

b. Minimum 24" x 24" samples to be submitted following approval of 12"x12" samples.

1) Submit up to 2 initial 24"x24" square samples to show full range of colors, details of graphics, and visual transparency. Adjustments by Artist to Artwork digital graphics files may be made by Artist in response.

2) Submit up to 2 additional 24"x24" square samples based on adjusted graphics.

c. For Tile Artwork: Color samples of sealants, grouts and any other Principal Project Company-provided materials exposed to view.

d. Protection materials.

2. Quality Control: Statement of qualifications for each installer related to Artwork. The Principal Project Company shall provide supporting documentation indicating past experience for each installer upon request of the Arts Commission.

1.5 PRE-ARTWORK INSTALLATION CONFERENCES

A. Principal Project Company to provide no less than 14 days advance notice and confirm attendance by Public Art Project Manager, Artist, and City's Authorized Representative.

1.6 IDENTIFICATION AND RESPONSIBILITY

A. Unless otherwise indicated, all items of work associated with the receipt of Artwork, initial inspection, storage, transportation, installation and protection of the Artwork indicated are the Principal Project Company's responsibility.

B. Principal Project Company shall jointly inspect the condition of each piece of Artwork with the Arts Commission upon receipt of Artwork delivery at the Principal Project Company's storage site and shall re-package the Artwork to the satisfaction of the Arts Commission after the inspection for storage and for subsequent transportation to the Project Site.

C. Installation requirements shall be as specified and as shown on the Principal Project Company's approved installation shop drawings. Artist and the Arts Commission shall be responsible for reviewing and approving the Principal Project Company-prepared installation shop drawings. Principal Project Company shall be responsible for preparation of substrates, wall recesses and openings, surfaces, and finishes in accordance with the approved shop drawings.

D. Principal Project Company Responsibilities. Principal Project Company shall:

1. Submit all Submittals as specified in this Section 01 14 00.

2. For Glass Artwork:

   a. Coordinate sampling process with the SFAC Public Art Project Manager.

   b. Coordinate the fabrication of Artwork in accordance with the requirements of SFAC.

3. For Tile Artwork: Prepare substrates, surfaces, and finishes receiving and/ or surrounding Artwork.

4. Receive, inspect, handle, repackage, protect, and store Artwork at an approved storage location not at the project construction site, and transport Artwork from the storage location to the Project Site for installation.

5. Install Artwork as shown on reviewed and approved shop drawings, under the supervision of the Arts Commission, Public Art Project Manager, Artist, and the City's Authorized Representative.

6. Develop installation schedule in consultation with Arts Commission for each Artwork element. Notify the Arts Commission of installation schedule for each Artwork.

7. Provide all anchorage, mounting, and installation devices and materials, hardware, and trim for Artwork as specified below, or as otherwise necessary to complete installation of the Artwork.

8. Replace and reinstall any and all defective installations by Principal Project Company of Artworks, to be determined by the Arts Commission.

9. Be responsible for cost of repair and replacement solely by the original Artist of any Artwork elements that are broken or damaged by Principal Project Company from the moment the Principal Project Company takes possession of the Artwork, during handling, unpacking, storage, transporting and installation, and until acceptance by the Arts Commission or Final Acceptance, whichever comes first.

E. Arts Commission Responsibilities. The Arts Commission will:

1. For Glass Artwork:

   a. Deliver digital production files of Artwork for glass fabrication.

   b. Communicate sampling process with Artist.

2. For Tile Artwork:

    a. Fabricate and deliver Artwork in a timely manner to a predetermined storage location for Principal Project Company acceptance, storage and installation with related construction.

3. Coordinate shop drawing review comments from the Artist to the City's Authorized Representative and Principal Project Company.

4. Conduct joint inspection of Artwork with Principal Project Company upon delivery of Artwork to storage location.

5. Coordinate with Principal Project Company for the time of delivery and method of transporting Artwork, storage, and supervision for installation of each Artwork item.

6. Review and approve installation of each Artwork as installation is completed by Principal Project Company.

7. Coordinate communication between Principal Project Company and Artist, and between Principal Project Company and other fabricators of Artwork.

1.7 PROJECT CONDITIONS

A. *[Left intentionally blank]*

1.8 QUALITY ASSURANCE

A. Pre-Installation Conferences(s): Principal Project Company shall schedule pre-installation meeting(s) with the City's Authorized Representative, Public Art Project Manager, Artist (if necessary), and appropriate members from the DB Contractor to coordinate and review details, schedules and responsibilities for the Work described in this Section.

B. The coordination and installation Work described in this section is integral with the Artwork. This work will be held to close scrutiny by the Arts Commission. The Principal Project Company shall hire qualified workers with demonstrable experience in handling, protection, and installation of glass, tile, and other materials used in the Artwork and shall ensure that such workers and materials meet the applicable qualifications set forth in clauses (C) and (D) below.

C. Glass Artwork Manufacturer Qualifications:

1. Manufacturer shall have experience sufficient to demonstrate at least 15 Artwork projects of similar size with digitally printed images on glass used at exterior locations.

2. Manufacturer of Artwork glass shall be capable of providing digitally printed inks on the same surface as low-E coatings.

3. All fabrication of glass, including cutting, drilling, grinding, and notching, shall be completed prior to application of artwork.

4. Digitally printed glass shall be viewed from 5 feet under natural daylight conditions for inspection of image quality.

    a. Defects such as pinholes, fisheyes, perceived color variation, and/or streaks shall not be acceptable when observable at 5 feet or more.

b. Image variation including off-parallel, missing, or shift images shall not be acceptable when observable at a distance of 5 feet. Image variation along the edges of the glass are not acceptable if they occur more than 1/8” from edge of glass.

D. Installer of Artwork Qualifications:

1. Installer shall have at least 5 years demonstrable experience in installation of similar artworks of types, materials, and sizes to be installed for this Project and shall be acceptable to the Arts Commission. Experience shall be documented in the form of a list of five (5) relevant completed projects with contact information for project references and a resume.

2. Installer must demonstrate experience in handling finely crafted elements, evidence of service orientation, capability of meeting close tolerances, and ability to work with the Arts Commission and Artists who will oversee and supervise the installation of the Artwork.

E. Mock-ups:

1. For glass Artwork panels, Principal Project Company shall provide three full size mock-ups as will be discussed/confirmed at the pre-production meeting. Final location of the mockups will be as approved by the SFAC Public Art Project Manager. The mock-ups shall be a complete installation to illustrate the interface between Artwork and joints between glass panels, including applicable sealants and lighting as indicated on the drawings or required by the specifications. Once approved, the full size in place mock-ups will be used as the standard for the subsequent installation quality of all glass panels for Artwork.

2. For two-dimensional wall mounted tile artwork, Principal Project Company shall install at least a 4’-0” x 4’-0” area on each wall to receive artwork. Installed samples are to serve as a mock-up for review and approval by the Arts Commission, Artist, and Principal Project Company for the installation workmanship, spacing and visual effect.

3. Each such mock-up, if approved by the Arts Commission and the City’s Authorized Representative, shall be the standard for installation of all art elements of the same type and may be incorporated in the final installation.

4. If any mock-up is not approved by the Arts Commission and the City’s Authorized Representative, Principal Project Company shall remove rejected mock-ups and create new mock-ups for review until approval is provided.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Principal Project Company shall receive, inspect, store, transport and handle Artwork and installation components with extreme care; and shall provide protective wrapping and padding as requested by the Arts Commission, and as otherwise required, until Artwork installation is completed.

1.10 WARRANTY

A. Principal Project Company shall provide a 5-year warranty for all labor and materials related to the installation of all Artwork.

PART 2 - PRODUCTS

2.1 ARTISTS AND ARTWORK

A. The Principal Project Company shall communicate solely with the Arts Commission through the Public Art Project Manager for all matters related to the Project installation schedule, delivery, storage, handling, actual installation, protection, and all other considerations related to the Artwork.

B. The Principal Project Company shall not contact any Artist directly without prior written authorization from the Public Art Project Manager.

2.2 INSTALLATION MATERIALS AND COMPONENTS

A. All setting materials, grout, sealants, metal connections, anchors and fasteners and accessories shall be specified in shop drawings by Principal Project Company

B. Colors for exposed items and materials will be selected by the Public Art Project Manager from manufacturer's custom colors.

C. Metal Connections, anchors and fasteners for glass Artwork shall:.

1. provide for expansion and contraction of artwork and substrate caused by a temperature range of 120 degrees F over a 12-hour period without detrimental effect to artwork, substrate, or supports.

2. support loads imposed by Artwork and to bridge variations in wall construction.

PART 2 - EXECUTION

2.3 EXAMINATION

A. Project Principal Company shall verify that surfaces, supporting structures, materials, and locations to receive Artwork have been reviewed and approved by the Public Art Project Manager and Arts Commission prior to installation of Artwork. If the Public Art Project Manager and Arts Commission determine that unsatisfactory conditions exist, Principal Project Company shall not commence installation until such conditions have been corrected.

B. Project Principal Company shall verify that field measurements are as shown on reviewed and SFAC-approved shop drawings.

C. Project Principal Company shall verify that staging area is of appropriate size and configuration for delivery and unloading of Artworks.

D. Project Principal Company shall verify that the delivery access from street level to the designated art locations is of the appropriate size, configuration and handling for delivery and unloading of Artworks.

2.4 INSTALLATION

A. Project Principal Company shall (i) provide a minimum of one month notice to SFAC and Artist prior to the actual start date of Artwork installation and (ii) show notice date in the Principal Project Company's Project Schedule as a milestone.

B. Principal Project Company is responsible for installing the Artwork in accordance with the requirements in the specification and as indicated in the Final Design Documents.

C. Principal Project Company shall be responsible for coordinating and implementing the work as required for the SFAC and the Artist as indicated in the Final Design Documents.

D. Project Principal Company shall protect the Artworks per approved installation plan.

E. At Substantial Completion, Project Principal Company shall (i) remove protective coverings only when directed by the Public Art Project Manager; and (ii) clean the Artwork, along with related setting materials and support or attachment devices to the satisfaction of the Public Art Project Manager and Arts Commission.

2.5 ACCEPTANCE OF ARTWORK BY CITY

A. The Public Art Project Manager will inspect and document Artwork upon completion of the Artwork installation.

B. The Public Art Project Manager and Arts Commission will approve or reject the condition of the Artwork upon notice of Substantial Completion as part of the Final Acceptance procedures.

2.6 ACCEPTANCE OF ARTWORK BY PRINCIPAL PROJECT COMPANY

A. Project Principal Company shall provide Risk of Loss insurance for the Artwork.

B. Upon acceptance of Artwork by the Public Art Project Manager and Arts Commission, Project Principal Company shall protect Artwork in accordance with corresponding, approved Submittals.

C. Project Principal Company shall pay costs associated with the correction of any damage to Artwork caused during construction. Principal Project Company shall make repairs to Artwork to the satisfaction of the Arts Commission and the Artist.

2.7 PROTECTION OF ARTWORK BY PRINCIPAL PROJECT COMPANY

A. Project Principal Company shall protect Artworks from damage during and after installation and damage from adjacent construction work. Protection includes but is not limited to non-staining, non-adhesive protective coverings, temporary equipment and other materials.

B. Project Principal Company shall remove coverings at time of Substantial Completion.

C. Principal Project Company shall be responsible for damages resulting from mishandling or inadequate protection until Art Commission approval or Final Acceptance, whichever is earlier. Damaged Artwork shall be repaired or replaced at the Principal Project Company’s expense.

2.8 CLEANING

A. Immediately prior to Substantial Completion, Project Principal Company shall remove coverings and clean Artwork, along with related setting materials and support/attachment devices, in a manner acceptable and under the supervision of the Public Art Project Manager and Arts Commission. Project Principal Company shall coordinate a test area with the Public Art Project Manager and clean the test area before proceeding with the rest of the Artwork. Project Principal Company shall ensure that installed Artwork is free of dust, debris, and foreign matter.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 33 - PARTNERING PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This specification sets forth the requirements for the City and Principal Project Company to establish a collaborative partnering process for the Project. The partnering process will assist the Parties to develop a collaborative environment so communication, coordination, and cooperation are the norm, and to encourage resolution of conflicts at the lowest responsible management level.

B. The partnering process is not intended to have any legal significance or to be construed as denoting a legal relationship of agency, partnership, or joint venture between the City and Principal Project Company.

C. This specification does not supersede or modify any other provisions of this Agreement, nor does it reduce or change the respective rights and duties of the Parties under this Agreement, or supersede contractual procedures for the resolution of disputes, including the submittal of a timely Notice of Contract Dispute.

1.2 DEFINITIONS

Unless specifically defined in this specification, all capitalized terms have the same meaning as defined in Exhibit 1 (Abbreviations and Definitions) of this Agreement.

A. Executive Team: Senior leaders from both the City and Principal Project Company organizations responsible for steering the Project to success. The Executive Team may function as the Project's board of directors.

B. Project Team: Key members of the City and Principal Project Company responsible for managing, implementing, and executing the Project, and who will participate in the partnering process.

C. Stakeholders: Any third party with a vested interest in the Project's outcome. Examples include end users, neighbors, vendors, and regulatory and funding agencies.

1.3 PURPOSE/GOALS

A. The goals of project partnering are to:

1. use early and regular communication with involved parties;

2. establish and maintain a relationship of shared trust, equity and commitment;

3. identify, quantify, and support attainment of mutual goals;

4. develop strategies for using risk management concepts and identify potential project efficiencies;

5. implement timely communication and decision-making;

6. resolve potential problems at the lowest possible level to avoid negative impacts;

7. hold periodic workshops to maintain the benefits of a partnered relationship;

8. establish periodic joint evaluations of the partnering process and attainment of mutual goals.

1.4 COSTS

A. Each party shall bear 50% of the costs of the partnering process set forth in this Section. No mark-up, overhead or other fees shall be added to the partnering costs. If the Principal Project Company fails or refuses to pay the facilitator invoices, the City may pay such invoices and deduct the Principal Project Company's portion from any amount that is due or may become due under the Agreement.

B. The fees and expenses of the facilitator, partnering training and workshop site costs, if any, shall be paid for by Principal Project Company.

C. Principal Project Company shall pay the invoices of the facilitator and/or workshop site costs after approval by both Parties and may seek reimbursement for City's share on its invoices.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PARTNERING INITIATION

A. No later than 60 days following NTP 1, Principal Project Company shall send the City a written invitation to enter into a partnering relationship for the Project.

3.2 PARTNERING ELEMENTS

A. At minimum, the Parties shall incorporate into the partnering relationship the following elements:

1. **Executive Sponsorship.** A commitment from the Executive Team to support and participate in the partnering process.

2. **Collaborative Partnering.** A structured and scalable process made up of elements that develop and grow a culture (i.e., value system) of trust between the Parties. Together, the combination of elements including the partnering charter, executive sponsorship, partnering workshops, accountability tools for the Project Team, and the facilitator create a collaborative atmosphere on the project.

3. **Facilitator.** The Parties shall select a professional neutral facilitator according to the process described in Section 3.3, below, to lead workshops.

4. **Partnering Charter and/or mission statement.** The Parties shall create a partnering charter that is the guiding focus for the Project Team. It shall document the Project Team's vision and commitment to work openly and cooperatively together toward mutual success during the Term. The partnering charter helps to maintain accountability and clarity of agreements made and allows for broader communication of the Project Team's distinct goals and partnering process. At minimum, the partnering charter must include the following elements:

    a. Mutual goals, including, at minimum, core goals related to the Project's schedule, budget, quality, and safety.

    b. Partnering maintenance plan that describes the frequency of partnering sessions, described in [Section 3.2.A.7], below.

c. Dispute resolution plan that includes an Issue Resolution Ladder, described in [Section 3.2.A.6], below.

d. Team commitment statement and signatures.

5. **Partnering Workshops.** The Parties shall hold the following partnering workshops:

a. **Kick-off Partnering Workshop.** The Parties shall hold a kick-off partnering workshop to mutually develop the framework for a successful partnering process. During the kick-off partnering workshop the Parties shall: (i) identify the members of the Project Team, Executive Team, and initial Stakeholders; (ii) draft a partnering charter and its components, described in [Section 3.2.A.4], above; (v) determine the locations for partnering workshops; and (vi) address other administrative details, as necessary.

b. **Project Team Partnering Workshops.** The Parties shall hold regularly scheduled partnering workshops for the Project Team as determined in the kick-off partnering workshop. Each workshop is a formalized meeting focused on developing a collaborative culture among the Project Team. The Project Team may use these workshops to set goals or commitments for the Project, attend joint training sessions, and perform other tasks. These partnering workshops are intended for the Project Team, though other partnering participants may attend as needed depending on the subject matter. Quarterly workshops are recommended.

c. **Executive Team Partnering Workshops.** The Parties shall hold partnering workshops or sessions for the Executive Team as determined in the kick-off partnering workshop.

6. Stakeholder Participation

a. If the Parties mutually agree, they may hold partnering workshops or sessions where they invite Stakeholders. The purpose of these workshops or sessions is that they be conducted as listening sessions where Stakeholders provide input. Frequency shall be as determined in the kick-off partnering workshop. Bi-annually workshops are recommended.

7. **Issue Resolution Ladder:** The Parties shall mutually develop a stepped process that structures informal, project-level negotiations between the Parties to addresses issues or disputes (“Issue Resolution Ladder”). The intent of this Issue Resolution Ladder is to provide a process that quickly elevates issues or disputes up the chain of command between the Parties before they proceed to mediation. The objective is to resolve issues or disputes at the lowest practical level and to not allow individual project issues to disrupt project momentum. When an issue or dispute is escalated one level, it is expected that a special meeting focusing on the negotiated settlement for that issue will be called with the goal of settling as quickly as possible.

Sample Issue Resolution Ladder			
Team Level	**City Department**	**Principal Project Company**	**Time to Elevate**
1	Project Manager	Project Manager	2 weeks
2	Project Director	Project Director	2 weeks
3	Division Manager	CEO	2 weeks

4	Deputy Department Director	Equity Member's Project Principal	2 week

8. Project Survey:

   a. The Parties shall participate in periodic partnering evaluation surveys to measure progress on mutual goals and short-term key issues as they arise.

3.3 SELECTION OF A FACILITATOR

A. No later than 90 days after NTP1 the Parties shall meet to mutually select a professional neutral facilitator for the Project in time to schedule and lead the kick-off partnering workshop. The facilitator shall lead other, follow-up partnering workshops and, if necessary or required, additional sessions.

B. The qualifications for the facilitator are, as follows:

   1. The facilitator shall be trained in the recognized principles of partnering;

   2. The facilitator shall have at least three years' experience in providing partnering facilitation services for public-sector construction projects;

   3. The facilitator shall have experience in construction management, negotiations, labor-management mediation, and/or human relations; and

C. The City, Principal Project Company, and the selected facilitator shall execute a third-party facilitator agreement. This agreement shall establish a budget for fees and expenses of the facilitator, workshop site costs, if any, and the terms of the facilitator's role consistent with the requirements of this specification.

D. The facilitator shall be evaluated by the Project Team: (i) at the end of the kick-off partnering workshop; and (ii) at the close-out partnering session.

E. If either the City or Principal Project Company is not satisfied by the services provided by the facilitator, a new and mutually acceptable facilitator shall be chosen in a reasonable amount of time and a new agreement shall be executed by Principal Project Company and the new Professional Neutral Facilitator pursuant to [Paragraph 3.3.C].

3.4 FACILITATOR QUALIFICATIONS AND REQUIREMENTS; EVALUATIONS

A. The facilitator shall be trained in the recognized principles of partnering.

B. The facilitator shall have the following professional experience and qualifications:

   1. At least 3 years' experience in partnering facilitation with a demonstrated track record, including public sector construction for a city or other municipal agency; and,

   2. Skill set that may include construction management, negotiations, labor management mediation, and/or human relations.

C. The facilitator shall be evaluated by the partnering team: (1) at the end of the kick-off partnering workshop; and (2) at the project close-out partnering session.

END OF SECTION

SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. General: This Section specifies administrative and procedural requirements for the submittal of pre-construction and construction photographs.

1.2 SUBMITTALS

A. General: All submitted photos will be kept by the City and will not be returned.

1. Pre-construction photographs: Project Principal Company shall submit pre-construction photographs in digital format as a condition precedent to NTP 2. Photos shall survey the Project Site with enough detail to show the conditions of the Project Site and adjacent buildings (exteriors and interiors) before the start of the D&C Work. PPC shall provide photographs from both the exterior of the building as well as the interior spaces.

    a. Photographs shall be individually labeled using numbering or lettering that identifies the location on a site plan and floor plans as well as a roof plan, see additional requirements below.

2. Construction Photographs: Project Principal Company shall submit construction photographs as described herein.

B. Format: Unless otherwise directed by the City, Project Principal Company shall submit photographs in digital format as high resolution images showing the date and time photographs were taken, transmitted on a CD, DVD, USB drive, or other medium as acceptable to the City.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Project Principal Company shall provide images in uncompressed TIFF or JPEG format, produced by a digital camera with a minimum sensor size of 10.0 megapixels and at an image resolution of not less than 3072 by 2304 pixels. The City will have all rights as owner of all photographs, including unrestricted use of and right to publish images.

PART 3 - EXECUTION

3.1 PHOTOGRAPHIC REQUIREMENTS

A. General: Project Principal Company shall take photographs using the maximum range of depth of field and that are in focus to clearly show the D&C Work. Photographs with blurry or out of focus areas will not be accepted.

1. Project Principal Company shall maintain a key plan with each set of construction photographs that identifies each photographic location.

B. Construction Photographs

1. Frequency: Project Principal Company shall take photographs as necessary to show progress of D&C Work, as a minimum coinciding with the 1st and 15th days of every month.

2. Project Principal Company shall take photos, including those for each bid item, showing different areas of D&C Work in progress. Photographs shall be taken such that the item or location being photographed shall be determinable from within the set of photographs.

3. Project Principal Company shall provide a location plan indicating the viewpoint from which the above-described photographs were taken and what they were taken of for each photograph. When possible, Project Principal Company shall take the photographs from the same location to provide a history of the progression of the Work.

C. Completion Photographs

1. Project Principal Company shall take photographs of each major phase or component of the D&C Work, as requested by the City and at a minimum at both Substantial Completion and Final Acceptance. Each major phase shall be established and identified in the Project Schedule.

D. Additional Photographs: The City may issue requests for additional photographs, in addition to the periodic photographs required to be submitted in accordance with this Section 01 32 33.

1. The City will provide PPC with three-Day's Notice of the requirement for additional photographs.

2. Circumstances that could require additional photographs include:

   a. The City’s request for special publicity photographs.

   b. Special events planned at the Project Site.

   c. Immediate follow-up when on-site events result in construction damage or losses.

   d. Extra record photographs after Final Acceptance.

END OF SECTION

SECTION 01 35 43 - ENVIRONMENTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:

1. General Construction Best Management Practices
2. Stockpile Management Best Management Practices
3. Dust Control Best Management Practices
4. Standard Stormwater Best Management Practices
5. Spill and Leak Control Best Management Practices
6. Emissions-Control Best Management Practices
7. Construction Noise Control Best Management Practices
8. Naturally Occurring Asbestos (NOA)
9. Asbestos Dust Mitigation Plan
10. Night Work
11. Environmentally Sensitive Area (ESA)
12. Bird Protection
13. Bat Protection (Not Applicable)
14. Tree Protection
15. Project Site Restoration
16. NOT USED
17. Human Remains
18. Archeological Resource Protection
19. Historical Cultural Resource Protection
20. San Francisco Environmental Code Clean Construction Requirements for Work in an Air Pollutant Exposure Zone (APEZ)
21. Construction Project Site Runoff Control Permit
22. Storm Water Pollution Prevention Plan (Not Applicable)
23. Water Quality Permitting
24. Emergency or Backup Diesel Generator Health Risk Reduction Plan
25. Fixed Mechanical Equipment Noise Control for Building Operations

26. Design Measures to Reduce Project Specific Wind Impacts

B. Plan Information Related to This Section
The following supplemental information shall be shown on the Design Documents:

1. Air Pollution Exposure Zone (APEZ) extent (see Article 3.20 of this section)

2. Areas within an MS4 within the jurisdiction of the Port of San Francisco (see Article 3.04 of this section)

3. Environmentally Sensitive Area (ESA) - Archaeological Monitoring Required for Ground Disturbance (see Article 3.18 of this section)

4. ESA - Biology/Other (see Article 3.11 of this section)

5. Disturbed areas whose surface is not otherwise converted to gravel, to pavement, to new landscaping as indicated on plans, or to new facilities (see Article 3.15 of this section)

6. Existing historic material in right-of-way, including granite curb (see Article 3.19 of this section)

7. Limits of mapped naturally occurring asbestos (see Article 3.05 and 3.06 of this section)

8. Species of trees to be removed or pruned (see Article 3.14 of this section)

1.2 REFERENCES

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D. Andrews, Jim, P.E., David Buehler, P.E., Harjodh Gill, Ph.D., Wesley L. Bender, Transportation and Construction Vibration Guidance Manual [CT-HWANP-RT-20-365.01.01]. California Department of Transportation, April 2020

E. Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, And Surface Mining Operations (California Code of Regulations Title 17, Section 93105)

F. Bald and Golden Eagle Protection Act, 16 USC § 668.

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I. Berglund, B. Guidelines for Community Noise - A complete, authoritative guide on the effects of noise pollution on health. World Health Organization, Geneva, 1999

J. California Code of Regulations, Title 8 Sec. 1592

K. California Department of Transportation, "The Construction Site Best Management Practices (BMPs) Manual". Available at https://dot.ca.gov/programs/construction/storm-water-and-water-pollution-control/manuals-a

L. California Fish and Game Code §§ 3503, 3513, and 3800

M. California Register of Historical Resources. Available at https://ohp.parks.ca.gov/?page_id=21238

N. California State Water Resources Control Board, Construction General Permit Order. See https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction/general_permit_reissuance.html

O. California Stormwater Quality Association (CASQA), Construction BMP Handbook. Available at: https://www.casqa.org/resources/bmp-handbooks

P. Caltrans Storm Water Quality Handbooks Construction Site Best Management Practices Manual available for download at: https://dot.ca.gov/programs/construction/storm-water-and-water-pollution-control/manuals-and-handbooks

Q. San Francisco Municipal Transportation Agency, 2012. Regulations for Working in San Francisco Streets, 8th ed. Available at: https://www.sfmta.com/reports/construction-regulations-blue-book

R. City of San Francisco, June 27, 2006. “Pruning Standards for Trees”. Available at http://sfpublicworks.org/sites/default/files/234-SF_Pruning_Stds_6.27approved.pdf

S. Federal Migratory Bird Treaty Act (16 USC § 703–711, 50 CFR 10)

T. Geological Features & Special Permits (California Public Resources Code Section 4307 and Section 4309)

U. National Historic Preservation Act of 1966, (16 U.S.C. 470)

V. National Register of Historic Places. Available at https://www.nps.gov/subjects/nationalregister/database-research.htm.

W. Native American Historic Resource Protection Act; Archaeological, Paleontological, and Historical sites; Native American Historical, Cultural, and Sacred sites (California Public Resources Code Section 5097-5097)

X. San Francisco Department of Public Health, “Monitoring Guidelines for SFHC Article 22B”. May be obtained by contacting SFDPH at EnvHealth.DPH@sfdph.org or:(415) 252-3800.

Y. San Francisco Environment Code Chapter 19: Mandatory Recycling and Composting. See https://codelibrary.amlegal.com/codes/san_francisco/latest/overview.

Z. San Francisco Environment Code Chapter 25: Clean Construction Requirements for Public Works. See https://codelibrary.amlegal.com/codes/san_francisco/latest/overview.

AA. San Francisco Health Code Article 22B – Construction Dust Control Ordinance #176-08. See https://codelibrary.amlegal.com/codes/san_francisco/latest/overview.

BB. San Francisco Industrial Waste Ordinance #19-92

CC. San Francisco Planning Code Article 10: Preservation of Historical Architectural and Aesthetic Landmarks. See https://codelibrary.amlegal.com/codes/san_francisco/latest/overview

DD. San Francisco Planning Code Article 11: Preservation of Buildings and Districts of Architectural, Historical, and Aesthetic Importance in the C-3 Districts. See https://codelibrary.amlegal.com/codes/san_francisco/latest/overview.

EE. San Francisco Planning Department, “Environmental Review Resources”. See: http://sf-planning.org/consultant-sponsor-resources.

FF. San Francisco Police Code, Article 29, Ordinance #274-72 ("Noise Ordinance"). See https://codelibrary.amlegal.com/codes/san_francisco/latest/overview.

GG. San Francisco Public Health Code, Article 22B: Construction Dust Control Requirements. See https://codelibrary.amlegal.com/codes/san_francisco/latest/overview.

HH. San Francisco Public Utilities Commission, Design Guidelines and Standards. Available at https://www.sfpuc.org/construction-contracts/design-guidelines-standards

II. San Francisco Public Works Code, Article 4.1 Sewer Use Ordinance. See https://codelibrary.amlegal.com/codes/san_francisco/latest/overview.

JJ. San Francisco Public Works Code, Article 4.2 Sewer System Management Ordinance. See https://codelibrary.amlegal.com/codes/san_francisco/latest/overview.

KK. San Francisco Public Works Code, Ordinance No. 260-13, Construction site Runoff Ordinance. See https://codelibrary.amlegal.com/codes/san_francisco/latest/overview.

LL. San Francisco Public Works Order 158,170, Wastewater discharges into the City sewerage system. See https://sfpublicworks.org/services/permits/public-works-orders.

MM. San Francisco Public Works Order 171,333, Dust Generation and Control Regulations. See https://sfpublicworks.org/services/permits/public-works-orders.

NN. San Francisco Public Works Order 171,378 Dust Control Order. See https://sfpublicworks.org/services/permits/public-works-orders.

OO. San Francisco Public Works Order 171,442 Regulation for Excavating and Restoring Streets in San Francisco. See https://sfpublicworks.org/services/permits/public-works-orders.

PP. San Francisco Public Works Order 172,596, Guidelines for Processing and Issuance of Special Sidewalk Permits within the Downtown Streetscape Areas. See https://sfpublicworks.org/services/permits/public-works-orders.

QQ. San Francisco Public Works Order 174,878, Regulations and Slip Resistant Standards for Any Manhole, Vault, or Sub-Sidewalk Basement Cover, Grille, Grate on the Public Sidewalk. See https://sfpublicworks.org/services/permits/public-works-orders.

RR. San Francisco Public Works Order 178,940, Regulations for Excavating and Restoring Streets in San Francisco. See https://sfpublicworks.org/services/permits/public-works-orders.

SS. San Francisco Public Works Order 200,369, Standard Paving Materials in San Francisco’s Public Right of Ways. See https://sfpublicworks.org/services/permits/public-works-orders.

TT. San Francisco Public Works Order 201,954, Recycling Cobblestones and Granite Curb. See https://sfpublicworks.org/services/permits/public-works-orders.

UU. Swiecki, Tedmund J.; Bernhardt, Elizabeth A. 2013. A reference manual for managing sudden oak death in California. Gen. Tech. Rep. PSW-GTR-242. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Grove

1.3 DEFINITIONS

A. Air Pollutant Exposure Zone: A zone having a substantially greater than average concentration of air pollutants as defined in San Francisco Health Code Section 3804.

B. ALERT sheet: Single-page flyer produced by the San Francisco Planning Department and provided to Principal Project Company, containing a notification that the project site may be located in an archaeologically sensitive area.

C. Alternative Fuels: Any transportation fuel that is less polluting than gasoline or petroleum diesel fuel, as determined by the California Air Resource Board and that is shown to have lower lifecycle carbon emissions than gasoline or petroleum diesel. Alternative Fuels may include but are not limited to natural gas; propane; biofuels from low carbon, sustainable and preferably local sources; hydrogen.

D. Alternative Sources of Power: Utility-based electric power or other power sources other than diesel engines.

E. CARB: The California Air Resources Board.

F. Archaeological resources: Remains of past human activity, including historic and prehistoric material such as tools and tool fragments, hearth and food remains, structural remains, and human remains.

G. Bridge: A structure that carries a utility or railroad or vehicle, pedestrian, or other traffic over, under, or around obstructions or waterways.

H. Building: A building as defined in the San Francisco Planning Code Section 102, Definitions.

I. CDFW: The California Department of Fish and Wildlife.

J. (Not used).

K. Clean Construction: The performance of all Construction Work required to be performed in the Contract Documents meeting the requirements in Sections 2504, 2505 and 2506 of the Environment Code, as applicable.

L. Construction Activities: The performance of all Construction Work, except for the issuance or obtaining of a site permit.

M. (Not Used).

N. Construction Phase: A particular construction activity over a certain period of time. Construction Phases may include demolition, site preparation, grading, building construction, architectural coatings, and paving. Multiple Construction Phases of a single project may take place at the same time.

O. SFDPH: The San Francisco Department of Public Health.

P. Environmentally Sensitive Area (ESA): Area within or near construction limits where access is prohibited or limited in order to protect environmental resources. An ESA – Biology is an ESA established to protect biological resources.

Q. Equipment Type: A category of off-road equipment (movable equipment not approved for driving on highways). Types of off-road equipment include bore/drill rigs, cranes, crawler tractors, excavators, graders, off-highway tractors, off-highway trucks, other construction equipment, pavers, paving equipment, rollers, rough terrain forklifts, rubber-tired dozers, rubber-tired loaders , scrapers, skid steer loaders, surfacing equipment, tractors/loaders/backhoes, and trenchers.

R. Erosion and Sediment Control Plan (ESCP): A site-specific plan that details the use, location and emplacement of sediment and erosion control devices.

S. Feasible: When applied to an action required of Principal Project Company, that action can be accomplished without resorting to extraordinary means and measures.

T. Ground surface: The top of existing soil or the level of the finished grade of a facility, sidewalk, or roadway.

U. Historic buildings, historic structures, and other historic resources: Buildings, structures, or other resources labeled as historic structures on Design Documents or in Reference Documents.

V. Inactive nests: Nests that do not contain eggs, chicks, or raptors displaying reproductive behavior.

W. In-Water Work: Work to be conducted below Mean Higher High Water (MHHW) lines as defined by the National Oceanic and Atmospheric Administration.

X. Land disturbance: Any movement of earth or a change in the existing natural soil cover or existing topography that may result in soil erosion from wind, or water, and the moving of sediments into or upon waters, lands or public rights-of-way within the City and County of San Francisco, including, but not limited to building demolition, clearing, grading, grubbing, filling, stockpiling, excavating and transporting over land.

Y. Major Construction Project: A public work to be performed within the geographic limits of the City and County of San Francisco that uses off-road equipment and that is estimated to require 20 or more cumulative days of work, including non-consecutive days, to complete.

Z. Most Effective Verified Diesel Emission Control Strategy (VDECS): a device, system or strategy that is verified, pursuant to Division 3, Chapter 14, of Title 13 of the California Code of Regulations, to achieve the highest available level of pollution control.

AA. Nesting Season: The City Planning Department anticipates nesting or attempted nesting by migratory and non-game birds from February 15 to August 31.

BB. Off-Road Engine: A non-road engine as defined in Title 40 of the Code of Federal Regulations, Section 89.2.

CC. Off-Road Equipment: Equipment with an off-road engine having greater than 25 horsepower and operating for more than 20 total hours over the entire duration of Construction Activities.

DD. On-Road Equipment: A heavy-duty vehicle as defined in Title 40 of the Code of Federal Regulations, Section 86.1803-01.

EE. Paleontological resources: Fossils and the deposits in which they are found. Fossils are evidence of ancient life preserved in sediments and rock. Examples of paleontological resources are the remains of (1) animals, (2) animal tracks, (3) plants, and (4) other organisms. Archaeological resources are not paleontological resources. Fossils found within an archaeological resource are generally considered archaeological not paleontological resources.

FF. PAR: Pedestrian access route as defined in the ADA and ABA Accessibility Guidelines for the Public Right-of-Way (An accessible, continuous, and unobstructed path of travel for use by pedestrians with disabilities within a pedestrian circulation path).

GG. Plant species that may harbor *Phytophthora*: The City Planning Department considers host species to include: Coast Live Oak (*Quercus agrifolia*), Canyon Live Oak (*Quercus chrysolepis*), California Black Oak (*Quercus kelloggii*), Shreve's Oak (*Quercus parvula* var. *shrevei*) , Tanoak (*Notholithocarpus densiflorus*), California bay laurel (*Umbellularia californica*).

HH. Portable Diesel Engine: A diesel engine that is portable as defined in 71 California Code of Regulations, Section 93116.2(bb).

II. Property line: The line at the ground surface at which the public right-of-way adjoins a platted parcel.

JJ. Rain event: A rain event is a forecast for the project area by the National Weather Service of a 50 percent chance of occurrence within the following 72 hours of an amount of precipitation of 0.50 inch or greater.

KK. Regulated Species: Species protected by one or a combination of the following:

1. Federal Endangered Species Act of 1973, 16 USC§ 1531 et seq.

2. California Endangered Species Act, Fish & Game Code§§ 2050-2115.5

3. Fish & Game Code§§ 1600-1616

4. National Environmental Policy Act, 42 USC§ 4321 et seq.

5. California Environmental Quality Act, Pub Res Code§ 21000 et seq.

6. Other law or regulation governing activities that affect species or their habitats.

LL. Routine Biological Activities: Biological monitoring, surveying, or other activity that does not require a take permit from the US Fish and Wildlife Service or National Oceanic and Atmospheric Administration (NOAA) Fisheries or a take permit or memorandum of understanding from the California Department of Fish and Wildlife.

MM. Sensitive receptor (air quality): Residence, school, childcare center, hospital or other health-care facility or group living quarters.

NN. Sensitive Use: A category of building use identified as a Sensitive Use in Health Code Section 3804.

OO. Sensitive receptor (noise): Any environment listed in Guidelines for Community Noise - A complete, authoritative guide on the effects of noise pollution on health (World Health Organization, Geneva, 1999). Table 4.1, for which the recommended noise levels are low, as low as possible, or a maximum LAeq[dB] <70. These include:

1. Outdoor living areas

2. Dwellings, indoors

3. Inside bedrooms

4. Outside bedrooms (window open)

5. School classrooms and pre-schools, indoors

6. Pre-school bedrooms, indoors

7. School, playground outdoor

8. Hospital, ward rooms, indoors

9. Hospitals, treatment rooms, indoors

10. Outdoors in parkland and conservation areas

PP. Service-Approved Biologist: Biologist whose activities must be approved by a state or federal agency as provided in applicable permit, license, agreement, certification, or any combination of these.

QQ. Soil: Native fill or introduced earthen fill. It does not include materials that were previously introduced as part of roadway pavement section (including asphalt concrete wearing surface, roadway base, and subbase).

RR. Stormwater Pollution Prevention Plan (SWPPP): A detailed plan that identifies potential sources of stormwater pollution, describes the practices that will be used to prevent stormwater pollution, and identifies procedures the operator will implement to comply with all requirements in the construction general permit.

SS. Take: Legal definition regarding harm to protected species as defined in 16 USC § 1532 and California Fish & Game Code § 86.

TT. Tier 2 Off-Road Emission Standards: The Tier 2 new engine emission standards in Title 13, California Code of Regulations, Section 2423(b)(1)(A) and/or Title 40, Code of Federal Regulations, Part 89.112(a).

UU. Unique Archaeological Resource is as defined in the California Environmental Quality Act statute at § 21083.2.

VV. VDECS: A verified diesel emission control strategy, designed primarily for the reduction of diesel particulate matter emissions, which has been verified by ARB pursuant to Verification Procedures, Warranty and In-Use Strategies to Control Emissions from Diesel Engines, Title 13, California Code of Regulations, Sectio ns 270 0-2710. VDECS can be verified to achieve Level 1 diesel particulate matter reductions (at least 25 percent), Level 2 diesel particulate matter reductions (at least 50 percent), or Level 3 diesel particulate matter reductions (at least 85 percent).

WW. Visible dust: Dust comprising visible emissions as defined in Bay Area Air Quality Management Board Regulation 6 – Particulate Matter.

1.4 SUBMITTALS

A. Principal Project Company shall submit the following to City prior to mobilization, or as otherwise stated herein:

1. The following plans and permits, with Regulatory Agency approvals wherever required:

a. Pre-construction survey for nesting birds that may be affected during construction work. (see Article 3.12 of this section)

b. Photographs of existing landscaping at the limit-of-work line(s). (see Article 3.14 of this section)

c. Tree protection fence locations and stake placement provided at least two weeks in advance of the date for any on-site review of the fence and stake placement. (see Article 3.14 of this section)

d. Written and/or photographic documentation of methods for avoidance of Environmentally Sensitive Areas. (see Article 3.11 of this section)

e. A copy of written notice, accompanied by proof of submittal, provided to the Bay Area Air Quality Management District in accordance with the requirement of the "Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations," in advance of roadway construction and maintenance activities in areas soils containing naturally occurring asbestos. (see Article 3.08 of this section)

f. Prior to issuance of construction permits, and prior to commencement of each construction stage, a Project-specific construction noise control plan shall be reviewed and approved by City Planning Department and City. (see Article 3.07 of this section)

g. Prior to issuance of construction permits, Principal Project Company's construction emissions minimization plan (CEMP) shall be reviewed and approved by City Planning Department and City. (see Article 3.06 and 3.20 of this section for CEMP plan requirements)

h. Principal Project Company's initial dust control plan (DCP). (see Article 3.03 of this section)

i. SFDPH Permit and notification for removal and installation of fuel or chemical storage tanks (see Article 3.23 of this section)

j. SFDPH Well Construction/Decommissioning or Soil Borings Permit (see Article 3.23 of this section)

k. Finalized Asbestos Dust Mitigation Plan approved by BAAQMD (see Article 3.09 of this section)

l. Prior to issuance of construction permits, and prior to commencement of each construction stage, a Noise Control Plan shall be reviewed and approved by City Planning Department and City (see Article 3.07 of this section)

m. San Francisco Public Works Night-Noise Permit (see Article 3.10 of this section)

n. Prior to issuance of a construction permit, an Archeological Monitoring Plan shall be reviewed and approved by City Planning Department.

o. The issued Construction Project Site Runoff Control Permit for the project from the SFPUC with written and schematic summary of details. (see Article 3.21 of this section)

p. The issued WDID for the Stormwater Pollution Prevention Plan (SWPPP) from the Regional Water Quality Control Board with certified SWPPP inspection checklist. (see Article 3.22 of this section)

q. (Not Used)

r. Underground Storage Tank (UST) Permit (see Article 3.23 of this section)

s. Well Construction/Decommissioning or Soil Borings Permit (see Article 3.23 of this section)

2. For the subject matter expert specialist services required to be retained and provided by Principal Project Company to perform work in this Section, submit qualifications for the following firms and persons specified in this Section to demonstrate their capabilities and experience to ensure full compliance with this Section:

a. Qualified Acoustical Consultant: A Board-Certified Institute of Noise Control Engineering (INCE) member or other qualified consultant or engineer approved by City.

b. Qualified Arborist: The Qualified Arborist who possesses a professional certification from the International Society of Arboriculture, and/or possesses a valid C-27 and/or a C-61/D-49 license in the State of California.

c. Specialty Environmental Monitor – archaeologist: One who in the determination of City is qualified to monitor land-disturbing activities for effects to buried archaeological resources.

d. Qualified Biologist is one whose activities must be approved by a State or federal agency as provided in the applicable permit, license, agreement, certification, or any combination of these. In the event that none of these apply, the biologist must possess at a minimum a bachelor's degree in Wildlife Biology or a closely related discipline, as approved by City.

e. Qualified Historic Architect or Historic Preservation Professional: Any consultant within the "Historic Resource Consultant Pool" as established by the San Francisco Planning Department.

f. Qualified SWPPP Practitioner (QSP): Individual who is authorized by the State Water Resources Control Board (SWRCB) to develop and revise Stormwater Pollution Prevention Plans. The QSP will have prepared a minimum of five (5) SWPPPs, including at least two (2) SWPPPs for Risk Level 2 and/or LUP Type 2. All five (5) SWPPPs will be available on SMARTS and to document these QSD qualifications. The QSP will have a minimum of 4 years demonstrable experience implementing SWPPPs and performing field inspections including two years on Risk Level 2 and/or LUP Type 2 projects under the General Permit. In addition to the CASQA certification, if Principal Project Company's QSP is a registered Civil Engineer, registered landscape Architect, or professional hydrologist, Principal Project Company's QSP will also possess one of the following certifications:

1) A Certified Professional (and Investigator) in Erosion and Sediment Control (CPESC) registered through Enviro Cert International, Inc.

2) A Certified Professional in Storm Water Quality (CPSWQ) registered through Enviro Cert International, Inc.

B. Principal Project Company shall submit the following to City during the course of the Construction Work:

1. Principal Project Company shall submit the "ALERT" sheet affidavit within five business days of the start of Construction Work. (see Article 3.18 of this section)

2. (Not Used)

3. Documentation of disposal in landfill or at a commercial composting facility of plant materials potentially harboring the *Phytophthora ramorum* pathogen within one week of disposal. (see Article 3.14 of this section)

4. Certificates of Quarantine Compliance from County Agricultural Commissioner documenting that hay, straw, or mulch used on the project has been inspected and is weed free before installation of stormwater BMPs. (see Article 3.04 of this section)

5. ESCP inspection checklists transmitted on a monthly basis (see Article 3.21/3.22 of this section)

6. Notification(s) that Change Orders or other changes in construction conditions will alter the ESCP, and any additional modifications to the ESCP (see Article 3.21/3.22 of this section)

7. Analytical water-quality monitoring results (see Article 3.21-3.23 of this section)

8. Noise complaint logs (see Article 3.07 of this section).

9. Photographic documentation of signage to be posted by the Principal Project Company as required by this section:

    a. A sign with the telephone number and a City person to contact regarding dust complaints and the BAAQMD's phone number (see Article 3.03 of this section)

    b. Legible and visible posted signs, in English, Spanish, and Chinese, in designated queuing areas and at the construction site to remind operators of the engine-idling limit (see Article 3.06 of this section)

    c. Signs on-site pertaining to permitted construction days and hours and noise complaint procedures and who to notify in the event of a problem, with telephone numbers listed (see Article 3.07 of this section)

    d. A legible and visible sign summarizing the Construction Emissions Minimization Plan (see Article 3.06 of this section)

10. Photographic documentation of temporary fence Type ESA at the entire perimeter of ESA -- Biology as shown on the Design Documents (see Article 3.11 and 3.14 of this section).

C. Principal Project Company shall submit to the San Francisco Planning Department after completion of construction activities and prior to receiving a final certificate of occupancy:

1. A final construction emissions minimization plan (CEMP) report summarizing construction activities, including the start and end dates and duration of each construction phase, and the specific information required in the CEMP. (see Article 3.06 of this section)

1.5 VIOLATIONS

A. Principal Project Company shall be responsible for all costs incurred or necessary to ensure compliance of its operations and their performance of the Construction Work with all applicable Environmental Laws and the requirements of this section, including the following:

1. If violations of the conditions of this section result in monetary fines, these will immediately be paid by the Principal Project Company.

2. If Principal Project Company finds the Design Documents are at variance with State or Federal environmental-regulatory requirements, Principal Project Company shall give the City prompt written notice thereof and shall make the Design Documents consistent with State or Federal environmental-regulatory requirements.

3. If violations of the conditions of this section result in fees charged by City Planning Department, state, or federal agencies to defray the costs of document processing and review, consultation with applicants, and administration of the statutory requirement, Principal Project Company shall pay the fees.

4. Principal Project Company shall be responsible for all monetary compensation for physical damage resulting from violations of conditions of this section. If the damage is to an environmental resource, including vegetation, wildlife, natural communities, cultural resources, and water quality that is protected by Federal law (including resources subject to Federal permitting and/or subject to evaluation under the National Environmental Policy Act), State law (including resources subject to state permitting and/or to evaluation under the Environmental Quality Act), and/or City Planning Department ordinance, Principal Project Company shall pay for all costs associated with environmental assessment of the damage and the costs of mitigation as determined by each AHJ.

5. Principal Project Company shall be responsible for all costs, including labor and material costs, for any site restoration or remediation necessary in the opinion of City to address the consequences of violations of this section.

6. In the event that violations of this section result in civil action(s) against the City, Principal Project Company shall pay all consequent legal fees associated with the action(s) and damages assessed in the action(s) against the City.

7. The City will provide no compensation to Principal Project Company for Project delays or work stoppages resulting from failure by Principal Project Company to comply with the terms of this section.

8. Any costs associated with requirements for additional environmental training imposed by City will be borne exclusively by Principal Project Company.

B. City reserves the right to require additional training, issue environmental non-compliance notices, have the necessary work performed by others at Principal Project Company's expense, assess non-compliance points or penalties, or to deduct or withhold all monies required therefore as permitted under the Contract Documents.

C. City and the Planning Department will inspect and monitor Principal Project Company's adherence to the requirements specified herein and will report on Principal Project Company's compliance. Pursuant to California Assembly Bill 3180 (chapter 1232), the City Planning Department at its own discretion will monitor Principal Project Company's compliance with the requirements of this section. Said monitoring and reporting activities may include qualitative, quantitative and video observations and data collection on the impacts of noise, vibration air quality, traffic, street pavement damage, water quality, cultural resources, biological resources and hazardous materials.

1. Principal Project Company shall cooperate with such inspection and monitoring activities, provide access to the Work site to establish and secure monitoring stations, and make its facilities and records available to the City Planning Department for performing such monitoring.

2. The City Planning Department will issue a Non-Compliance Notice to Principal Project Company for any detected non-compliance with the provisions herein or of any environmentally objectionable acts and the corrective action to be taken.

3. The City Planning Department will inspect and monitor Principal Project Company's adherence to the requirements specified herein and will report on Principal Project Company's compliance.

D. If Principal Project Company uses off-road equipment and/or off-road engines in violation of the Clean Construction requirements set forth in Administrative Code Section 6.25 and Chapter 25 of the Environment Code, City will suffer actual damages that will be impractical or extremely difficult to determine. Accordingly, Principal Project Company agrees to pay City the amount of $100 per day per each piece of off-road equipment and each off-road engine used to complete Construction Work on the Project in violation of the Ordinance. Such amount will not be considered a penalty, but rather agreed monetary damages sustained by City because of Principal Project Company's failure to comply with the Clean Construction requirements.

1. False Representations: False representations by the Principal Project Company, in connection with the bidding, execution or performance of the Agreement, regarding the nature or character of the off-road equipment and/or off-road engines to be utilized or to the City Planning Department about the nature or character of the off-road equipment and/or off-road engines actually used may subject Principal Project Company to the consequences of noncompliance specified in Section 2510 of the Environment Code, including but not limited to the penalties prescribed therein. The assessment of penalties for noncompliance will not preclude the City Planning Department from exercising any other rights or remedies to which it is entitled.

E. Trees and plants destroyed or damaged beyond repair due to Principal Project Company's negligence, failure to provide adequate protection, or failure to perform recommended selective pruning will be compensated by Principal Project Company at no additional cost to the City.

1. Damage beyond repair that requires replacement will be determined by the Public Works Bureau of Urban Forestry.

a. If Principal Project Company should cause minor damage as defined by nicked tree trunks, limbs and branches or broken branches to trees or shrubs during the course of construction, Principal Project Company shall pay the following penalties at the beginning of each billing period:

1) Principal Project Company shall be penalized the sum of One Hundred dollars ($100) for the first incident which causes minor damage to trees or shrubs.

2) Principal Project Company shall be penalized the sum of Two Hundred dollars ($200) for the second incident which causes minor damage to trees or shrubs.

3) Principal Project Company shall be penalized the sum of Five Hundred dollars ($500) for the third and subsequent incidents which cause minor damage to trees or shrubs.

b. Principal Project Company shall replace any trees or shrubs that suffer more serious damage, including damage to roots 2-inches in diameter or larger, during construction at no additional cost to the City. The Public Works Bureau of Urban Forestry will determine the value of such replacement trees or shrubs. In addition to Principal Project Company's restoration approved by the Public Works Bureau of Urban Forestry, the Principal Project Company shall be assessed damages for the difference in the dollar value of the damaged tree or other plant material, and the dollar value of the replacement.

c. The dollar value will be determined by the Public Works Bureau of Urban Forestry from the “Guide for Establishing Values of Trees and Other Plants,” prepared by the Council of Tree and Landscape Appraisers, current edition. Damages assessed will be deducted from moneys due or that may become due to Principal Project Company.

d. Principal Project Company shall in addition be liable for the cost to the City for removing the damaged tree(s). This cost will cover 1.5 times the hourly wage of all person(s) at the site for the required hours to remove the tree(s) and haul offsite as directed by the Public Works Bureau of Urban Forestry.

2. Replacement will include the replacement plant material, transportation, installation, a 30-day maintenance period, and a one-year warranty.

3. Planting location for replacements may be different from the original location and will be determined by the Public Works Bureau of Urban Forestry.

4. Replace shrubs, ground cover and turf with plants similar in species, size and shape.

5. Replace trees with plants of same species, size and shape.

6. Replacements for trees of 2"-8" caliper will be replaced with similar sized plants; trees over 8" caliper will be 60" box size.

7. Since age and size of existing tree may prohibit replacement with same size tree, the difference in caliper between size of damaged tree and replacement of tree will be compensated by Principal Project Company.

8. Principal Project Company shall fell trees to be removed so that trees to remain are not injured.

F. Principal Project Company is responsible for liquidated damages of $1,600 for each day for which the presence of the Specialty Environmental Monitor – Archaeologist was requested but not cancelled within the prescribed timeframe.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL CONSTRUCTION BEST-MANAGEMENT PRACTICES

A. Principal Project Company shall maintain the Project Site and Construction Work areas under its control and adjacent public rights-of-way in a clean and orderly state, a safe condition, and remove all accumulations of debris and surplus materials at the end of each workday. Waste materials, trash, and debris are the property of the Principal Project Company.

1. Principal Project Company shall initiate and maintain a specific daily program to prevent the accumulation of debris at the construction site, storage and staging areas, parking areas, and along streets, roads, and haul routes in the immediate vicinity of the Project Site, to include, at a minimum:

a. Keeping all debris, hazardous/contaminated material, surplus concrete and excavated materials off the roadway and sidewalks and out of catch basins at all times.

b. Damp-sweeping all pedestrian walkways and dispose of debris around the site perimeter on a daily basis and as often as determined by City.

c. Daily inspection of traffic areas and haul routes to enforce debris and clean up requirements and daily removal of all debris from the Project Site and Construction Work areas, including haul routes, caused directly or indirectly by Principal Project Company's operations.

d. Ensuring that materials to be used for construction are stored in designated structures or areas by the appropriate trades. Maintain such areas or structures in a clean condition daily for the portion of the Term that commences on NTP 2 and ends on the Final Acceptance Date.

e. Maintaining hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly and dispose those types of materials in a lawful manner. Principal Project Company shall comply with requirements of NFPA 241 for removal of combustible waste material and debris.

f. Providing and maintaining covered containers for the deposit of debris and keep them covered.

g. Disposing of all food-related trash items (e.g., wrappers, cans, bottles, food scraps) in closed trash containers, which shall be emptied daily. Principal Project Company shall provide separate containers for recyclables, compostables, and landfill-bound trash. Burying or burning of trash and debris on the Project Site is not permitted.

h. In the event that Principal Project Company observes any rodent or insect infestation, Principal Project Company shall effectively control such infestation by the use of such poisons, gas traps, or insecticidal sprays as meet the written approval of the Director of Public Health (San Francisco Public Works Code, Article 17: Control of Dumps Disposing of Materials from Construction or Demolition, Section 858: Rodent and Insect Control) as verified by City.

i. Providing licensed waste material handlers to service portable sanitary facilities and trash dumpsters weekly, or more often if needed or if directed by City.

j. Controlling aerial deposition of site materials, including metals, nutrients, organics, sediment, other particulates, and trash.

k. Overseeing all cleaning of areas by trades using them and ensure that resulting accumulations are deposited in appropriate containers.

2. Principal Project Company is specifically prohibited from disposing of paint, petroleum products, dirty water, soil sterilants, concrete slurry or any other deleterious materials to soil.

3. Principal Project Company shall maintain the Project Site, equipment, fences and signs free of graffiti. As warranted, Principal Project Company shall remove all graffiti daily, using methods which cause no damage to the Project, Construction Work or existing facilities.

4. Principal Project Company shall locate site construction staging areas away from public view and on paved or previously disturbed areas to the extent feasible.

5. No firearms will be allowed within the construction limits.

6. At Final Acceptance, Principal Project Company shall leave the Project Site in clean and orderly condition.

3.2 STOCKPILE-MANAGEMENT BEST MANAGEMENT PRACTICES

A. Principal Project Company shall implement the following stockpile management best management practices to ensure no visible dust and to control stormwater discharges of stockpiled material, including all erodible stockpiled construction materials and landscape materials:

1. Locate stockpiles at a minimum of 50 yards away from concentrated flows of storm water, drainage courses and inlets.

2. Stockpiles must be kept adequately wetted, treated with a chemical dust suppressant, or covered when material is not being added to or removed from the pile.

3. Any excavated soils should be removed from the Project Site by the end of the day, if in the opinion of City, this can be accomplished without resorting to extraordinary means and measures.

4. Stockpiles/storage piles greater than ten cubic yards or 500 square feet of excavated materials, backfill material, import material, gravel, sand, road base, and/or soil that will remain inactive for more than seven (7) days will be covered with a 10 mil (0.01 inch) polyethylene plastic or equivalent tarp and braced it down, or use other equivalent soil stabilization techniques as approved by City.

5. Principal Project Company shall monitor the National Weather Service forecast daily for forecasts of a rain event. When a rain event is forecasted for the Project area by the National Weather Service with at least a 50 percent chance of occurrence within the following 72 hours, Principal Project Company shall cover stockpiles with a 10 mil (0.01 inch) polyethylene plastic or equivalent tarp and brace it down.

6. During the rainy season, Principal Project Company shall also implement the following best management practices:

   a. Stockpiles shall be protected with a temporary linear sediment barrier berm prior to the onset of precipitation. Surround stockpiled material with fiber rolls, gravel sediment barrier, silt fence or other runoff controls as approved by the City Planning Department.

   b. Use inlet controls such as block gravel sediment barriers when stockpiles are proximate to catchbasins. Silt fencing will be additionally installed at the foot of the slope around the entire perimeter of stockpiled soil.

   c. Where necessary, V-ditches and silt traps/sediment traps will be installed at the perimeters of stockpiles to collect runoff to allow flow to continue to storm drain inlets.

3.3 DUST-CONTROL BEST MANAGEMENT PRACTICES

A. Principal Project Company shall ensure no visible dust is generated through construction.

1. Principal Project Company is responsible for taking all reasonable measures to furnish all labor, equipment, and means required to carry out effective measures whenever and as often as necessary to prevent its operation from producing dust in amounts damaging to surrounding properties or causing a nuisance to businesses and local residents.

2. Principal Project Company shall post a publicly visible sign with the telephone number and person to contact at Principal Project Company regarding dust complaints. The BAAQMD's phone number will also be visible to ensure compliance with applicable regulations.

B. Principal Project Company shall not engage in any construction or grading operation on property unless all the following dust mitigation measures are initiated at the start and maintained throughout the duration of the construction or grading activity:

1. Vehicle and equipment maintenance:

a. Principal Project Company shall maintain tire inflation to the manufacturers' inflation specifications.

b. Principal Project Company shall limit vehicle speed limit on unpaved roads to 15 miles per hour (mph), or less if required to minimize dust emissions.

c. Principal Project Company shall ensure that equipment, trucks and tires are washed down before moving from the active areas on to a paved public road to minimize deposition of dust-causing materials.

d. Principal Project Company shall load haul trucks, hauling debris, soils, sand or other such materials so that the material does not extend above the walls or back of the truck bed. Principal Project Company shall wet each load before covering and shall tightly cover the surface of each load before the haul truck leaves the loading area.

1) The Principal Project Company shall cover and line the truck bed ("burrito wrap") with 10mil HDPE for all truckloads of soils containing naturally-occurring asbestos.

2. Limitations on grinding, crushing, and ground disturbance:

a. Principal Project Company shall plan and execute the work in such manner as to ensure that the total of soils-disturbing construction activities never amount to one half acre of area at any one time unless otherwise directed by City.

b. Principal Project Company shall terminate surface excavation and grading activities when wind speeds exceed 25 miles per hour.

c. Principal Project Company cannot perform screening or crushing operations without the appropriate BAAQMD and Cal-EPA/DTSC permits for these activities.

3. Principal Project Company shall ensure that all borrow areas are protected with appropriate erosion control measures to the satisfaction of City.

4. Use of water for dust control:

a. Whenever feasible, Principal Project Company shall use reclaimed water for dust control activities.

b. Principal Project Company shall treat and amend all water for dust control with biodegradable, non-polluting, non-toxic dust control agent.

c. Principal Project Company shall conduct mist or spraying activity in such a way as to prevent puddling or generation of runoff.

d. Prior to any ground disturbance, Principal Project Company shall apply enough water to the area to be disturbed to prevent visible emissions from crossing the Project Site boundaries.

e. Principal Project Company shall perform continuous water spraying during dust generating activities, including but not limited to demolition, excavation, and earthmoving.

f. Principal Project Company shall keep areas being graded or excavated wetted to the extent required to prevent visible emissions from crossing the Project Site and property line.

g. Principal Project Company shall wet all exposed soil surfaces at least three times daily during dry weather or more frequently if dust is blowing or if required by City.

h. Principal Project Company shall ensure that a water truck and/or water buffalo always is readily available at the Project Site. Localized dust controls such as water hoses shall be pre-connected to a water source or water canisters to immediately control visible dust emissions at each active work area.

i. Principal Project Company shall ensure that water trucks are equipped with hand-held hoses. Hoses shall be equipped with micro-misters and micro-foggers.

j. In wet areas, Principal Project Company shall ensure that caution signs are posted to prevent slipping hazards.

5. Principal Project Company shall provide dust control for disturbed surface areas to include one or more of the following so as to prevent dust from becoming airborne:

   a. Keeping the surface wetted so that no visible dust is produced.

   b. Establishment and maintenance of surface crusting.

   c. Application of chemical dust suppressants or chemical stabilizers according to the manufacturers' recommendations as needed.

   d. Covering with tarp(s) or vegetative cover.

   e. Installation of wind barriers across open areas.

6. Principal Project Company shall implement the following for management of excavated material and demolition debris at the Project Site:

   a. Minimize to the extent feasible the amount of excavated material or demolition wastes stored at the site.

   b. Minimize the amount of excavated materials stored at the site.

   c. Remove all demolition debris from the site no later than the end of each workday.

7. Principal Project Company shall clean up spillage on City streets, whether directly or indirectly caused by Principal Project Company's operations.

8. Principal Project Company shall eliminate track-out from the construction site and, at a minimum shall comply with the following:

a. Principal Project Company shall immediately remove any visible track-out of asphalt, soil, gravel, debris and dirt from a paved public road at any location where vehicles enter and exit the site.

b. All visible mud or dirt track-out from areas of land disturbance onto adjacent City streets shall be removed using wet power vacuum street sweepers at least once per day.

c. The use of dry power sweeping is prohibited.

d. Principal Project Company shall install one or more of the following track-out prevention measures at all entry and exit points. These track-out controls are to be cleaned, maintained and replaced to keep their use effective for the project duration.

1) A gravel pad designed using good engineering practices to clean the tires of exiting vehicles.

2) A metal griddle (rumble plate) tire shaker.

3) A wheel wash system.

4) Pavement extending for not less than fifty (50) consecutive feet from the intersection with the paved public road; or

5) Any other measure as effective as the measures listed above as approved by City.

9. Principal Project Company shall implement the following regimen of sweeping:

a. Keep the entire site of the work and adjacent areas (including sidewalks, 500 consecutive feet in all directions of intersections, walkways and roadways) continuously free of dirt and dust by wet sweeping at least three times per shift, including at the end of the workday. Use a wet sweeping or a HEPA filter equipped vacuum device on at all entry and exit points more frequently if needed to keep free of dirt and dust.

b. Clean visible track-out on the paved public road using wet sweeping or a HEPA filter equipped vacuum device.

c. Always maintain a regenerative air or high efficiency vacuum sweeper-vehicle on the Project Site. City will evaluate the effectiveness of Principal Project Company's vacuum sweeper-vehicle and, if necessary, will require Principal Project Company to provide a more powerful and effective sweeper.

10. When directed by City, Principal Project Company shall use dust enclosures, curtains, and dust collectors to control dust.

C. Prior to grading or excavating an approved Site-Specific Dust Control Plan (DCP) under the Dust Control Ordinance (San Francisco Health Code Article 22B) is required.

1. Principal Project Company shall incorporate in its Project Schedule the time it will take for the SFDPH to review and approve the DCP application and the DCP. Principal Project Company shall take into account and incorporate in its Project Schedule the time it will take to implement the provisions of the DCP.

2. Principal Project Company shall submit a completed application and pay the associated fees to the SFDPH. Principal Project Company may not commence Construction Work, demolition, excavation, grading, foundation work, or other permitted activities until Principal Project Company has submitted to City and City Planning Department a copy of SFDPH director's written approval of the DCP, the plan provisions have been implemented, and the City has subsequently given Principal Project Company permission to proceed. All provisions of the approved plan become the responsibility of the Principal Project Company.

3. Principal Project Company shall interpret as mandatory all guidance in the Department of Public Health's handout "Monitoring Guidelines for SFHC Article 22B" in the event that the Plan requires monitoring.

3.4 STANDARD STORMWATER BEST-MANAGEMENT PRACTICES

A. Unless otherwise superseded by the terms of the Erosion and Sediment Control Plan, Principal Project Company shall design, install, and maintain effective Project-specific Project Site sediment controls to minimize the discharge of pollutants utilizing site-specific BMPs. These BMPs include but are not limited to the following:

1. Immediately initiate stabilization for disturbed areas whenever earth disturbance has permanently ceased on any portion of the site, or temporarily ceased on any portion of the site where earth disturbance will not resume for a period exceeding 14 calendar days.

2. Principal Project Company may stabilize soil exposed soil using bonded-fiber matrices, hydromulches, spray tackifiers, or other land-applied products: Principal Project Company shall apply the product according to the manufacturer's instructions and guidance; and apply the product according to the manufacturer's guidance to allow for ample cure time and to prevent treatment chemicals from being transported by runoff.

3. Principal Project Company may use Erosion Control Blankets to control to stabilize disturbed and exposed soil if exposed soil generates visible runoff.

B. Principal Project Company shall install BMPs, including temporary sediment barriers, soil stabilization measures, and sediment basins, sufficient to control erosion and subsequent sediment discharges from the Project Site, at locations with potential for erosion and as otherwise directed by City. These include all exposed soils and construction site entrances and exits.

1. Principal Project Company shall design BMPs according to the California Stormwater Quality Association's (CASQA) current Construction BMP Guidance Handbook and utilize outlet structures that withdraw water from the surface, unless infeasible.

2. Sandbags shall be stockpiled on site and placed there at intervals as directed by City. After rain events, Principal Project Company shall check for and remove sediment trapped by sandbags at staging area. Principal Project Company shall replace sandbags if deterioration is evident.

3. BMPs shall be relocated as necessary for construction operations, with prior written approval from City.

4. BMPs shall be installed so as not to compromise safety of vehicles operating in roadways adjacent to erosion control BMPs.

5. Principal Project Company shall remove the temporary BMPs when permanent measures are in place.

C. Principal Project Company shall contain packaged landscape materials (e.g., fertilizers) when they are not being actively used, and apply erodible landscape material at quantities and rates according to manufacturer recommendations or based on written specifications by knowledgeable and experienced field personnel. Principal Project Company shall discontinue the application of any erodible landscape material at least 2 days before a forecasted precipitation event.

D. During the rainy season, Principal Project Company shall inspect all erosion control measures daily and after each storm. Any damaged BMP shall be repaired at the close of each day and whenever rain is forecast. During the rainy season, erosion control BMPs (with the exception of sprayed products) shall be available on-site, or at a nearby location (e.g., common lay-down yard), year- round with trained persons able to deploy the product.

E. Principal Project Company shall conduct a pre-rain-event inspection within 72 hours prior to any forecasted rain event. Precipitation forecast information shall be obtained from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at https://www.weather.gov/) and shall be included as part of the inspection checklist weather information. If extended forecast precipitation data (greater than three days) is available from the National Weather Service, the pre- precipitation event inspection may be done up to 120 hours in advance. During periods when storms are forecast, Principal Project Company shall:

1. Inspect all stormwater drainage areas to identify leaks, spills, or uncontrolled pollutant sources and when necessary, implement appropriate corrective actions to control pollutant sources.

2. Ensure that excavated soils are not be placed in streets or on paved area, and all paved areas are to be kept clear of earth material and debris.

3. Remove any excavated soils from the Project Site by the end of the day if feasible.

4. Clean and skim drainages and detention basins daily.

F. Principal Project Company shall divert run-on water flowing onto the construction site from off-site areas to prevent its contributing to the construction site's stormwater. Installation of run-on diversion shall occur prior to entering an area affected by construction activity. Principal Project Company shall ensure that run-on flow diversion is conveyed through or around the construction activity in plastic pipe or an engineered conveyance channel in a manner that will not cause erosion due to flow diversion.

G. Principal Project Company shall secure and contain concrete washout areas and other washout areas that may contain additional pollutants to prevent discharge into the underlying soil and onto the surrounding areas and into the sewerage system. Principal Project Company shall ensure that wash waters from equipment and vehicle washing, wheel wash water, masonry wash waters, and other wash waters are captured and treated prior to discharge or disposal at a permitted facility that can accept that waste. Washout areas shall be covered prior to and during a precipitation event.

H. Principal Project Company shall remove sediment and trash accumulated in drainages or detention basins as soon as possible. In addition, oil and material floating on water surface must be skimmed weekly and the debris properly disposed of. Principal Project Company shall cover waste disposal containers at the end of every business day and during a precipitation event.

I. Principal Project Company shall minimize soil compaction in areas other than where the intended function of a specific area dictates that it be compacted.

J. Principal Project Company shall implement the following materials selection and handling BMPs to the extent feasible:

1. Minimize exposure of construction materials, equipment, and maintenance supplies (e.g., fuels, lubricants, paints, solvents, adhesives) to precipitation.

2. Identify and protect the products used and/or expected to be used and the end products that are produced and/or expected to be produced from exposure to stormwater. Products do not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (e.g., poles, equipment pads, cabinets, conductors, insulators, bricks, roofing, and siding).

3. Implement BMPs to control the discharge of plastic materials and limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Principal Project Company shall consider the use of plastic materials resistant to solar degradation where plastic materials are deemed necessary.

3.5 SPILL AND LEAK CONTROL BEST MANAGEMENT PRACTICES

A. Principal Project Company shall assign and train spill-response personnel, who will address spills and leaks immediately and dispose of leaked materials properly in accordance with the law.

B. Principal Project Company shall provide spill cleanup material on site to adsorb, remove and contain any spill or releases from leaving the active work area and entering into any storm drain or sewer inlet. Principal Project Company shall maintain a fully stocked spill kit(s) at the Project Site for immediate deployment. Principal Project Company shall keep enough spill cleanup material with vehicles and equipment to handle potential spills. Spill cleanup equipment will include absorbent socks, over pack drums, personal protective equipment, shovel, labels, valves, valve charts, valve wrenches to shut off water supply, etc.

C. Principal Project Company shall ensure On-site vehicles are periodically monitored for leaks during the workday.

D. Principal Project Company shall store inactive equipment with drip pans to contain any fluid leaks. Drip pans containing oil must be drained into waste oil drums on a regular basis.

E. Principal Project Company shall ensure that all hazardous material stored on-site, including but not limited to lubrication oil, hydraulic fluids, waste oils, fuels, solvents and hazardous or toxic wastes, is stored in watertight secondary containment or in a completely enclosed storage area. The containment must be covered with temporary tarps to prevent storm water contact.

F. Principal Project Company shall provide containment (e.g., secondary containment) of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants.

G. Principal Project Company shall dispose of spent cleanup materials at a California-permitted waste-disposal facility. Leaked materials that constitute hazardous waste shall be disposed of in accordance with applicable hazardous materials specifications.

H. Principal Project Company shall ensure that containers remain closed at all times except when transferring contents. Heavy containers (in excess of 60 lb.) of oil or hazardous material shall not be moved by a single unassisted worker unless the worker employs a drum dolly.

I. Principal Project Company shall use funnels, pumps with closed hose systems, or other means to prevent spills while transferring material from large containers to small ones. Pumps in operation shall not be left unattended.

J. Principal Project Company shall place all equipment or vehicles which are to be fueled in a designated area away from catchbasins fitted with functional, appropriate leak-containment BMPs. Principal Project Company shall (i) maintain clean fuel-dispensing area(s) using dry cleanup methods (sweeping for removal of litter and debris or use of rags and absorbents for leaks and spills), (ii) place drip pans or other containment beneath each connection point to capture all spills and drips, (iii) cover storm drains in the vicinity during transfer and (iv) maintain ample spill clean-up equipment adjacent to the fueling area.

K. Principal Project Company shall conduct an end-of-day inspection of the Work area for leaks, spills or other discharges.

L. Principal Project Company's designated Project Safety Officer shall immediately be alerted to any spill occurring in the Work area. It is the responsibility of the Project Safety Officer to direct the cleanup activities and contact City immediately in accordance with the requirements of the Contract Documents .

M. Principal Project Company is responsible for recording all steps taken to control spills in the field notes/daily log.

3.6 EMISSIONS-CONTROL BEST MANAGEMENT PRACTICES

A. Principal Project Company shall comply with the following engine requirements:

1. All off-road equipment greater than or equal to 25 horsepower shall have engines that meet U.S. EPA or California Air Resource Board (CARB) Tier 4 Final off-road emission standards. Principal Project Company shall register and obtain an Equipment Identification Number (EIN) per vehicle/equipment over 25 horsepower with the California Air Resources Board.

2. Where access to alternative sources of power are available, portable diesel engines shall be prohibited. If access to alternative sources of power is infeasible, portable diesel engineers shall meet the requirements of subsection 3.6.A.1 above.

B. Principal Project Company may pursue the following waiver:

1. City Planning Department may waive the equipment requirements of subsection 3.6.A.1 if a particular piece of off-road Tier 4 Final equipment is not regionally available, not technically feasible, or would not produce desired emissions reduction due to expected operating modes. In granting the waiver, Principal Project Company must demonstrate with substantial evidence that the project construction does not exceed the BAAQMD threshold for NOx (54 lbs/day) by resulting in a net increase of average daily NOx emissions greater than 4 pounds per day. The Principal Project Company must also demonstrate with substantial evidence that the overall combined construction and operational excess cancer risk does not exceed 7 per 1 million persons exposed at nearby sensitive receptors.

C. Principal Project Company shall ensure that all equipment is tuned and maintained in accordance with the manufacturer's specifications. Principal Project Company shall instruct construction workers and equipment operators on the maintenance and tuning of construction equipment and require that such workers and operators properly maintain and tune equipment in accordance with manufacturer specifications.

D. Principal Project Company shall limit the hours of operation of heavy-duty equipment and/or amount of equipment in use to what is needed.

E. Principal Project Company shall prohibit idling of motors when equipment is not in use or when trucks are waiting in queues. The idling time of all construction equipment used at the site shall not exceed 5 minutes.

1. Diesel engines, whether for off-road or on-road equipment, shall not be left idling for more than two minutes at any location, except as allowed for in applicable State regulations regarding idling for off-road and on-road equipment (e.g., traffic conditions, safe operating conditions). If such equipment is within 100 feet of a school zone idling times shall be limited to 30 consecutive seconds.

2. Principal Project Company shall post legible and visible signs, in English, Spanish, and Chinese, in designated queuing areas and at the construction site to remind operators of the idling limit.

F. Principal Project Company's Construction Emissions Minimization Plan (CEMP) requirements include:

1. Before starting onsite construction activities, Principal Project Company shall submit a CEMP to City Planning Department for review and approval. The CEMP shall state, in reasonable detail, how Principal Project Company will meet the requirements of section 3.6 of this specification.

2. The CEMP shall include estimates of the construction timeline by phase, with a description of each piece of off-road equipment required for every construction phase. The description may include, but is not limited to equipment type, equipment manufacturer, equipment identification number, engine model year, engine certification (Tier rating), horsepower, engine serial number, and expected fuel use and hours of operation.

3. Principal Project Company shall ensure that all provisions of the approved CEMP are incorporated into the Project Agreement Technical Requirements and are followed in daily construction activities. The CEMP shall include a certification statement that Principal Project Company agrees to comply fully with the CEMP.

4. Principal Project Company shall make the CEMP available to the public for review onsite during working hours. Principal Project Company shall post at the construction site a legible and visible sign summarizing CEMP. The sign shall also state that the public may ask to inspect the CEMP for the project at any time during working hours and shall explain how to request to inspect the CEMP. Principal Project Company shall post at least one copy of the sign in a visible location on each side of the construction site facing a public right-of-way.

G. Principal Project Company shall perform the following monitoring:

1. After start of construction activities, Principal Project Company shall submit biannual reports to City Planning Department documenting compliance with the Construction Emissions Minimization Plan.

3.7 CONSTRUCTION NOISE CONTROL BEST MANAGEMENT PRACTICES

A. Prior to issuance of any demolition permit or building permit, Principal Project Company shall submit a project-specific construction noise control plan to City Planning Department for review and approval. The construction noise control plan shall be prepared by a qualified acoustical engineer, with input from the design-build contractor, and include all feasible measures to reduce construction noise. The construction noise control plan shall identify noise control measures to meet a performance target of construction activities not resulting in a noise level greater than 90 dBA at noise-sensitive receptors and 10 dBA above the ambient noise level at

noise-sensitive receptors. Principal Project Company shall ensure that requirements of the approved construction noise control plan are incorporated into the Project Agreement Technical Requirements and followed during construction activities. If nighttime construction is required, the plan shall include specific measures to reduce nighttime construction noise. The construction noise control plan shall also include measures for notifying the public of construction activities, complaint procedures, and a plan for monitoring construction noise levels in the event complaints are received. The construction noise control plan shall include the following measures to the degree feasible, or other effective measures, to reduce construction noise levels.

1. Use construction equipment that is in good working order, and inspect mufflers for proper functionality; and

2. Select “quiet” construction methods and equipment (e.g., improved mufflers, use of intake silencers, engineer enclosures); and

3. Use construction equipment with lower noise emission ratings whenever possible, particularly for air compressors; and

4. Prohibit the idling of inactive construction equipment for more than five minutes; and

5. Locate stationary noise sources (such as compressors) as far from nearby noise-sensitive receptors as possible (including future onsite noise-sensitive receptors at the Phase 2 Bryant Street housing development under phased construction scenarios for the refined project under the Final EIR), muffle such noise sources, and construct barriers around such sources and/or the construction site; and

6. Avoid placing stationary noise-generating equipment (e.g., generators, compressors) within noise-sensitive buffer areas (as determined by the acoustical engineer) immediately adjacent to neighbors (including future onsite noise-sensitive receptors at the Phase 2 Bryant Street housing development under phased construction scenarios for the refined project under the Final EIR); and

7. Enclose or shield stationary noise sources from neighboring noise-sensitive properties (including the future onsite noise-sensitive receptors at the Phase 2 Bryant Street housing development under phased construction scenarios for the refined project under the Final EIR) with noise barriers to the extent feasible. To further reduce noise, locate stationary equipment in pit areas or excavated areas, if feasible; and

8. Install temporary barriers, barrier-backed sound curtains and/or acoustical panels around working powered impact equipment and, if necessary, around the perimeter of active construction areas or phases. When temporary barrier units are joined together, the mating surfaces shall be flush with each other. Gaps between barrier units, and between the bottom edge of the barrier panels and the ground, shall be closed with material that completely closes the gaps, and dense enough to attenuate noise.

9. Under the phased construction scenarios for the refined project as defined in the Final EIR, develop strategies to reduce exposure to construction noise in coordination with future onsite noise-sensitive receptors at the Phase 2 Bryant Street Housing development under phased construction scenarios for the refined project under the Final EIR. Some options to reduce noise include limiting noise to Phase 2 Bryant Street housing development receptors by delaying or limiting occupancy in units closest to the construction zone or notifying receptors of loud construction periods. These options should be explored as part of the noise control plan prepared by a qualified noise consultant and the design-build contractor.

B. The construction noise control plan shall include the following measures for notifying the public of construction activities, complaint procedures, and monitoring construction noise levels, including the following requirements, procedures, and corrective measures:

1. Designate an on-site construction noise manager for the project; and

2. Notify neighboring noise-sensitive receptors within 300 feet of the project construction area at least 30 days in advance of high-intensity noise-generating activities (e.g. pier prilling, pile driving, and other activities that may generate noise levels greater than 90 dBA at noise-sensitive receptors) about the estimated duration of the activity (including future onsite noise-sensitive receptors at the Phase 2 Bryant Street housing development under the phased construction scenarios for the refined project under the Final EIR); and

3. Post a sign onsite describing noise complaint procedures and a complaint hotline number that shall always be answered during construction, and provide to City and City Planning Department photographic documentation that the signage has been posted; and

4. Implement a procedure for documenting all noise complaints received in a noise complaint log which shall be kept up to date and available to City upon request. At a minimum, the following information will be documented in the log: date of complaint, contact information for person providing a noise complaint, reason for the complaint, action taken and/or resolution; and

5. Notify City within 48 hours of each noise complaint with an explanation of the corrective measures taken, if applicable, and notify City Planning Department within one week of receiving a complaint; and

6. Establish a list of measures for responding to and tracking complaints pertaining to construction noise, taking all reasonable steps to resolve the complaint and the source of the noise impact, including providing additional monitoring as required, and modifying or implementing better attenuation controls for any construction equipment or activities that generated the excessive noise levels. Such measures may include the evaluation and implementation of additional noise controls at sensitive receptors (residences, hospitals, convalescent homes, schools, church, hotels and motels, and sensitive wildlife habitat); and

7. Principal Project Company shall subsequently perform further periodic inspections to confirm that the modified or improved noise control minimization measures are effective; and

8. Conduct noise monitoring (measurements) at the beginning of major construction phases (e.g., demolition, grading, excavation) and during high-intensity construction activities to determine the effectiveness of noise attenuation measures and, if necessary, implement additional noise control measures.

C. The construction noise control plan shall include the following additional measures in the event of pile-driving activities:

1. When pile driving is to occur within 600 feet of a noise-sensitive receptor, implement “quiet” pile-driving technology (such as pre-drilling of piles, sonic pile drivers, auger cast-in-place, or drilled-displacement, or the use of more than one pile driver to shorten the total pile-driving duration [only if such measure is preferable to reduce impacts to sensitive receptors]) where feasible, in consideration of geotechnical and structural requirements and conditions;

2. Where the use of driven impact piles cannot be avoided, properly fit impact pile driving equipment with an intake and exhaust muffler and a sound-attenuating shroud, as specified by the manufacturer; and

3. Conduct noise monitoring (measurements) before, during, and after the pile-driving activity.

D. Notwithstanding the requirements stated in section 3.06.A and 3.06.B, before the onset of Construction Work, Principal Project Company shall implement minimization controls to ensure that the maximum noise level from any individual article of powered construction equipment other than to impact tools and equipment will not be greater than 80 dB(A) at 100 feet, to the greatest extent feasible.

1. Principal Project Company shall notify neighbors and occupants within 300 feet of the Project construction area at least 30 days in advance of impact-related noise-generating activities about the expected noise levels and their estimated duration.

2. Principal Project Company shall implement the following controls with respect to the use of all impact equipment:

   a. Noise from impact tools may not exceed 90 dBA 1-hour L_{eq} at the surface property line nearest to ongoing construction activities.

   b. Impact tools and equipment shall have intake and exhaust mufflers recommended by the manufacturers thereof and approved by the Director of San Francisco Public Works or the Director of Building Inspection as best accomplishing maximum noise attenuation.

   c. Pavement breakers, jackhammers, and similar impact equipment shall be equipped with acoustically attenuating shields and shrouds and/or jackets as recommended by the manufacturers thereof and approved by the City Planning Department.

   d. Use of impact tools shall be restricted to the daytime construction hours of 8:00 a.m. to 3:30 p.m.

   e. Principal Project Company shall use sonic or vibratory sheet pile drivers, rather than impact sheet pile drivers. Where the use of vibratory sheet pile drivers cannot be avoided, properly fit impact sheet pile driving equipment with an intake and exhaust muffler and a sound-attenuating shroud, as specified by the manufacturer.

   f. Principal Project Company shall limit phases of construction that require daily use of impact equipment to periods of no more than 10 consecutive days.

3. If, before construction mobilization, Principal Project Company determines that these standards and/ or one or more of these controls cannot be applied, Principal Project Company shall immediately alert the City Planning Department. If directed by the City Planning Department, Principal Project Company must revise the project-specific construction noise control plan and resubmit for City Planning Department review and approval. Principal Project Company's proposed revisions to the construction noise control plan must be prepared by a qualified acoustical engineer and demonstrate to the City Planning Department what alternative measures will be taken to reduce the impacts of construction noise to the extent feasible. The revised construction noise control plan must be approved by the City Planning Department and Principal Project Company shall enact all of its provisions before Project Principal Company commences Construction Work that may exceed the standards or omit the controls required above.

a. If, as determined by City, the requirement for the construction noise control plan arises during the course of construction, such as through Principal Project Company's exceedances of these noise standards and/or by Principal Project Company's inability to apply one or more of these controls, Principal Project Company shall be directed by City to cease the use of equipment that is responsible for exceedances. Principal Project Company may resume the use of such equipment after the construction noise control plan is approved and all its provisions are enacted. City will not be responsible for any financial consequences to Principal Project Company of such work slowdowns or stoppages.

E. Unless otherwise stated herein, Principal Project Company shall implement sufficient best-available control techniques to ensure that noise generated by each piece of powered construction equipment when in use is below the 80 dB(A) at 100 feet threshold. These may include but are not limited to any combination of the following:

1. The use of mufflers, intake silencers, ducts, engine enclosures and acoustic attenuating shields, barriers, or shrouds for construction equipment and trucks.

2. The use of hydraulic or electric-powered in preference to diesel-powered construction equipment.

3. The use of drilling equipment in preference to impact equipment whenever feasible.

4. Installation of temporary improvements to the noise-reduction capability of adjacent buildings.

5. Erection of temporary plywood noise barriers around construction sites, and construction of temporary or permanent noise barriers around staging areas, shafts, and flow-control construction areas.

a. Where temporary barrier units are joined together, the mating surfaces shall be flush with each other. Gaps between barrier units, and between the bottom edge of the barrier panels and the ground, shall be closed with material that completely closes the gaps, and dense enough to attenuate noise.

F. Principal Project Company shall locate stationary noise sources (e.g., ventilation fans, generators, dewatering pumps) as far away from the perimeter of the construction area as feasible and away from residential and commercial uses. Principal Project Company shall enclose equipment such as large compressors, generators, and large dewatering pumps at a minimum in 1-inch-thick plywood sheds. Openings in these enclosures shall face inwards towards the center of the Project-construction area.

G. Principal Project Company shall direct all truck traffic to designated truck routes that avoid areas that are predominantly residential areas to the extent feasible.

H. The Principal Project Company will periodically monitor the effectiveness of noise attenuation measures by taking noise measurements. In the event that noise exceedances are recorded, Principal Project Company shall modify existing or implement better attenuation controls for any construction equipment or activities that generated the excessive noise levels. Principal Project Company shall subsequently perform further periodic inspections and monitoring to confirm that the modified noise control minimization measures are effective.

1. When directed by City, Principal Project Company shall submit revisions to the approved construction noise control plan for review and written approval if, in the sole determination of City, modified noise control minimization measures are not effective. In the event that revisions to the construction noise control plan are required, Principal Project Company shall cease the use of equipment that is responsible for exceedances.

Principal Project Company may resume the use of such equipment after the revised construction noise control plan is approved and all its provisions are enacted. City will not be responsible for any financial consequences to Principal Project Company of such work slowdowns or stoppages.

3.8 NATURALLY OCCURRING ASBESTOS (NOA)

A. For all work in any areas of serpentine, serpentinite, or other ultramafic rocks containing Naturally Occurring Asbestos (NOA), as known through USGS map, soil assessment, soil sampling or other information, Principal Project Company shall adhere to the provisions of California Code of Regulations§ 93105, Title 17, California Code of Regulations - Asbestos Airborne Toxic Control Measure (ATCM) for Construction and Grading Operations and CCR Title 8, Section 1529, Asbestos.

B. If Principal Project Company disturbs, grades or excavates more than one acre (43560 sq. ft.) of area mapped as containing NOA, such Construction Work may not be implemented without first obtaining written approval by BAAQMD of an Asbestos Dust Mitigation Plan and written approval of City.

1. In the event that a Project Change Order results in an exceedance of this threshold, no Project ground disturbance, grading, or excavation may occur without first obtaining written approval by BAAQMD of Asbestos Dust Mitigation Plan (ADMP), implementation of the ADMP, and written approval of City.

C. At no cost to the City, Principal Project Company shall hire an experienced Certified Industrial Hygienist (CIH) to serve as Cal/OSHA Asbestos Class II asbestos operations Asbestos Competent Person (ACP).

1. The ACP shall train Principal Project Company's workers and tradespeople who may come into contact with serpentine, serpentinite, or other ultramafic rocks containing Naturally Occurring Asbestos (NOA) for Class II work activity level as per the Cal/OSHA standard 8 CCR § 1529.

2. The ACP shall be present at the Work site in compliance with requirements specified in the Cal/OSHA standard 8 CCR § 1529, and whenever Construction Work is conducted where serpentine, serpentinite, or other ultramafic rocks containing Naturally Occurring Asbestos (NOA) is present.

3. The ACP shall enforce the dust-control provisions of these specifications.

D. Before work in areas of NOA shown in the Design Documents that intersect with areas of roadway construction and maintenance which require the disturbance of soils by construction and grading, Principal Project Company shall submit the Bay Area Air Quality Management District's (BAAMQD) "Notification Form for Road Construction and Maintenance Operations" to BAAMQD fourteen business days in advance of land disturbance of soils containing NOA.

E. Unanticipated Discovery of Naturally Occurring Asbestos (NOA):

1. If NOA is unexpectedly encountered after the project has started, Principal Project Company shall immediately notify City and shall:

a. Submit a notification to the BAAQMD no later than the next business day using the Asbestos Dust Mitigation Plan (ADMP) Discovery Notification Form found at the link below: https://www.baaqmd.gov/~/media/Files/Compliance%20and%20Enforcement/Asbestos/admp_discovery_application.ashx?la=en, and followed by email to the BAAQMD, and at the same time notify City with the same details.

b. Principal Project Company shall immediately implement the ADMP provisions and may continue Construction Work with the written approval from City.

c. Any measures imposed by the BAAQMD pursuant to the submittal of the ADMP Discovery Notification will be provided to City and implemented by Principal Project Company within 24 hours of receipt.

3.9 ASBESTOS DUST MITIGATION PLAN

A. If Principal Project Company by its means and methods disturbs, grades or excavates more than one acre (43560 sq. ft.) and the site is known through USGS map assessment, soil sampling or other information indicating that the Project will be disturbing NOA, as shown in the Design Documents, the following indicated control, administrative, reporting and submittal requirements will apply.

1. Sixty days (60) days before commencement of grading, and excavation activities, Principal Project Company shall submit to City an Asbestos Dust Mitigation Plan (ADMP) for review.

2. Upon City's written approval, Principal Project Company shall submit the ADMP, the ADMP application, and the BAAQMD Regulation 3 Fees to the APCO for its review and approval. Principal Project Company shall furnish all information required by the BAAQMD to amend and finalize the ADMP. Principal Project Company shall not be reimbursed for the BAAQMD Regulation 3 Fees.

3. No soil disturbance, construction or grading shall commence unless the ADMP and its amendments is approved by the BAAQMD. Prior to commencement of any grading and excavation activities, Principal Project Company shall implement the ADMP. Principal Project Company shall implement and maintain the ADMP from the commencement of the Construction Work through the duration of the Project Construction Work.

4. Principal Project Company at its own cost shall furnish all labor, equipment, and means required to prepare and implement the ADMP, conduct the ambient and perimeter air monitoring as required by the BAAQMD's terms of approval of the ADMP and California Code of Regulations, Title 17, Section 93105. Principal Project Company shall incorporate in its Project Schedule the time it will take for the BAAMQD to review and approve the ADMP application and the ADMP. Principal Project Company shall take into account and incorporate in its Project Schedule the time it will take for the BAAMQD to review the storage and staging locations, etc., for the final approval of the ADMP. Any fines imposed on the City by the BAAQMD as a result of Principal Project Company's negligence will be passed on to Principal Project Company.

5. Principal Project Company, at no cost to the City, will perform perimeter air monitoring for asbestos at the Project Site during its soil disturbance activities for the duration of the Project. This will be in accordance with the approved ADMP. Principal Project Company shall submit all record keeping and reporting to the BAAQMD on a weekly basis or as per a reporting schedule requested by BAAQMD.

3.10 NIGHT WORK

A. If Principal Project Company is to perform any part of the Work between the hours of 8 p.m. and 7 a.m. or on weekends or holidays, subject to any and all special permits and authorizations, Principal Project Company shall comply with all of the following:

1. Lighting Controls

a. Lighting systems with flood, spot, or stadium type luminaires shall be aimed downward at the Work and rotated outward no greater than 30 degrees from nadir (straight down).

b. When, in the opinion of City, the lighting is disturbing adjoining property, Principal Project Company shall modify the lighting arrangement or add hardware to shield the light trespass.

c. When working adjacent to marine environments (the Pacific Ocean, San Francisco Bay, tidal inlets of the Bay), artificial lighting of the construction area during nighttime hours shall be minimized to the maximum extent practicable without substantial impairment of workers' safety and working conditions. At least two weeks prior to the commencement of Construction Work, Principal Project Company shall submit a lighting plan demonstrating that all lighting will be directed away from the marine environment and natural areas for written approval by City.

2. Noise controls:

a. Principal Project Company must obtain and comply with a noise permit pursuant to Police Code Section 2908 prior to starting any Construction Work between the hours of 8 p.m. and 7 a.m. Principal Project Company must apply for noise permits at least 15 working days in advance of night (i.e., between 8:00 p.m. and 7:00 a.m.), weekend, and holiday work. The requirements of the Contract Documents, including safety requirements, apply for all night, weekend, and holiday Work performed. The noise permit will be obtained from and approved by Bureau of Street Use and Mapping, 49 South Van Ness Ave, Suite 3rd Floor, San Francisco, CA 94103.

b. Project Principal Company shall reduce the use of vehicles for night Construction Work that are legally required to be equipped with backing warning alarms to the extent feasible for night Construction Work, and Principal Project Company shall implement administrative controls as defined in the California Code of Regulations, Title 8 Sec. 1592 for worker protection for backing movements by other vehicles.

c. Principal Project Company shall not perform Construction Work between the hours of 8:00 p.m. and 7:00 a.m. of the following day if the noise level created thereby is in excess of the ambient noise level by 5 dBA at the nearest property line, unless approved by City and unless a noise permit for such work has been obtained pursuant to the Police Code Section 2908.

3.11 ENVIRONMENTALLY SENSITIVE AREA (ESA)

A. Principal Project Company shall be aware of and protect environmentally sensitive areas (ESAs)within or near construction limits where access is prohibited or limited in order to protect environmental resources.

1. Principal Project Company shall implement Caltrans temporary fence Type ESA at the entire perimeter of any ESA -- Biology as shown in the Contract Documents.

2. Principal Project Company shall prevent personnel and equipment from entering the ESA.

3. Principal Project Company shall coordinate methods for avoidance intrusion into ESAs with City and provide written and photographic documentation of these methods used in the field before NTP2.

3.12 BIRD PROTECTION

A. Principal Project Company shall perform all Construction Work in a manner that complies with the Migratory Bird Treaty Act (MBTA) and California Department of Fish and Game Code Section 3503, 3503.5, and 3513 (in addition to the Federal Endangered Species Act and California Endangered Species Act for listed birds).

1. Principal Project Company is advised that is unlawful under the California Fish and Game Code at §3503 to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by California Code. Principal Project Company is advised that it is unlawful under the California Fish and Game Code at §3503.5 to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by California Code.

B. Where Construction Work begins in advance of the bird-nesting season (February 15 through August 31), Principal Project Company shall be responsible for passively deterring birds from establishing active nests within the work area during construction, including on equipment. Methods for doing so may include installing bird deterrents (e.g., flash tape, false eyes, and audio deterrents), covering equipment with bird netting when not in use, and minimizing onsite attractants like slash or debris piles. Deterrents will be installed during the non-nesting season (September to February 14), unless otherwise approved by City. Principal project Company shall comply with the following:

1. Before trimming or removing trees, shrubs, and vegetation and/or performing structure alteration during bird nesting season (February 15 through August 31), a Qualified Biologist must be obtained by Principal Project Company to provide a pre-construction survey for nesting bird that may be affected during Construction Work.

2. Principal Project Company's Qualified Biologist shall conduct the nesting bird pre-construction survey within the 14 days before the commencement of Construction Work. If commencement of Construction Work is delayed beyond the two-week timeframe, the survey shall be repeated. If Construction Work begins in different areas at different times or there are periods of more than two weeks when no Construction Work is being conducted, Principal Project Company shall ensure that additional surveys are conducted by the Qualified Biologist in each area before the commencement of Construction Work in such area.

3. Principal Project Company shall be responsible for coordinating with City on schedule and confirming that surveys have been completed prior to initiation of any tree, shrub, and vegetation removal during this time. There will be no cost to the City (time or schedule) if there is a delay in the start of Construction Work at any location due to Principal Project Company's providing inadequate time for the Principal Project Company's Specialty Biological Monitor to perform a required survey.

4. The Qualified Biologist shall conduct migratory bird surveys within 250 feet of the construction area boundaries for nesting passerines and 500 feet for nesting raptors, as allowed by landowner access.

5. If no active nests are detected during surveys, then no additional mitigation is required.

6. If inactive nests (those that do not contain eggs, chicks, or raptors that appear to be establishing a nest) are identified and removal is authorized in writing by the City, Principal Project Company shall provide equipment and labor to remove the nest. Principal Project Company shall assume the support of a man lift for 5 working days.

7. If active bird nests are identified by the Qualified Biologist, no Work may occur at that tree or structure and in the surrounding area:

    a. For active nests found in trees, a 100-foot exclusion buffer of temporary fencing shall be erected around the tree with the active nest,

    b. For active nests found on bridges, a 100-foot exclusion buffer shall be established around the nest site, and no Work may occur within the 100-foot buffer until the Qualified Biologist has verified that young birds have left the nest, and that active nesting has been completed.

    c. For any active nests containing raptor species, the exclusion buffer will be 300-feet.

8. Principal Project Company shall immediately upon finding an injured or dead bird or discovering migratory or nongame bird nests within or adjacent to limits of project construction:

    a. Stop all Work within a 100-foot radius of the discovery.

    b. Notify City.

9. If active nests are detected, no Construction Work shall occur within 50 feet of any passerine nest or within 300 feet of any active raptor nest, unless otherwise allowed by the City.

C. Principal Project Company shall perform one or a combination of the following protection measures as required to prevent further nesting by birds in trees or structures during Project construction:

1. Install exclusion devices

2. Use nesting-prevention measures

3. Remove and dispose of partially constructed and unoccupied nests of migratory or nongame birds on a regular basis to prevent their occupation.

3.13 BAT PROTECTION

A. Not applicable

3.14 TREE PROTECTION

A. Prior to NTP2, Principal Project Company shall arrange a meeting on the site with City, Contractor, and such others as City may direct to review the Project Schedule, the “Trees of Concern”, the tree and landscape protection Submittals for this Section, the coordination with Work of other trades, and the selective thinning and clearing requirements. Adjustments to the type and extent of the protection shall be addressed at the time of the meeting.

1. Principal Project Company shall coordinate the meeting and inform all parties in writing (5) business days in advance of the scheduled meeting.

B. Principal Project Company’s equipment shall arrive on the Project Site clean of soil, seeds, and plant parts. Before tracked and heavy construction equipment leaves the Project Site, any accumulation of plant debris, soil and mud shall be washed off the equipment or otherwise removed onsite, and air filters shall be blown out. This shall be done in a manner that allows for collection of any plant debris, soil and mud for off-site disposal to prevent the spread of weeds.

C. Principal Project Company shall implement the following practices and measures to prevent damage to trees within the area of Work:

1. Vehicles and equipment shall be operated in such a manner as to avoid damage to tree and bush trunks, leaves and branches. Principal Project Company shall ensure that no damage to trees or landscaping is caused by maneuvering of vehicles or equipment, stacking of materials and equipment, or storage of vehicles, equipment, or supplies.

2. Pruning of trees shall be performed in conformance with the City of San Francisco Pruning Standards for Trees (June 27, 2006) (available at https://sfpublicworks.org/sites/default/files/234-SF_Pruning_Stds_6.27approved.pdf), only as authorized by the City's Bureau of Urban Forestry, and under the supervision of the qualified arborist. Thinning shall not remove more than thirty percent (30%) of the existing leaf surface.

3. Principal Project Company shall not place backfill under protected trees unless indicated otherwise. Where fill is required for grading, and as indicated in the Design Documents, no fill shall be placed above existing grade line at trunks. Fill soil must percolate at a rate of 1"" per hour minimum.

4. Principal Project Company shall not change site grades which cause drainage to flow into or to collect near protected trees.

5. Principal Project Company shall not use protected trees as support posts, power poles, crane stays, sign posts, or anchorage for ropes, guy wires, power lines, or other similar functions.

6. Principal Project Company shall not damage trees through exposure to excessive water or heat from equipment, utility line construction, or burning of trash under or near shrubs or trees.

D. Principal Project Company shall implement the following practices and measures to prevent damage to tree roots:

1. Principal Project Company's vehicles and equipment shall not be driven off-road except along designated routes as far away as practical from tree root zones.

2. Principal Project Company is prohibited from stockpiling any excavation or construction materials within the canopy of trees, on lawn areas or near shrubs.

3. Excavated material (fill and overlay) shall not be deposited under the leaf/needle canopy of established trees. The excavated material shall be placed in piles along one side of a paved surface. In no case will Principal Project Company place the excavated material closer than 6-feet from the base of a tree.

4. Principal Project Company shall immediately clean and remove any construction residue that falls within the canopy of a tree or near shrubs.

5. Principal Project Company shall exclude grading or placement of heavy equipment within the drip line of trees on or adjacent to the site, unless approved by City. If approved by City, Principal Project Company's arborist will recommend and Principal Project Company shall implement measures to protect the tree (e.g., protecting the roots from compaction). Principal Project Company shall be responsible for replacing any damaged trees as directed by the City Planning Department.

6. Principal Project Company shall tunnel around roots where practical; otherwise, roots will be cut off approximately six inches (6") from construction and shall comply with the following:

a. Principal Project Company shall not rip or tear roots and shall prune injured roots cleanly and backfill as soon as possible.

b. If trimming of roots greater than 2-inches in diameter or fibrous root bundles of similar diameter is necessary during the course of construction, a Qualified Arborist provided by Principal Project Company shall supervise the trimming of such roots.

c. If immediate backfill is not possible, exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or exposed roots shall be packed with wet peat moss or four (4) layers of wet untreated burlap and temporarily supported and protected from damage until permanently covered with backfill.

7. Principal Project Company shall not induce damage to tree root systems from flooding, erosion, excessive wetting or drying resulting from dewatering or other operations.

8. Principal Project Company shall observe the following restrictions on underground trenching in the vicinity of trees:

a. Principal Project Company is prohibited from using powered equipment for trench and excavation Work within the tree drip line or where root intrusion exists on asphalt pathways to be reconstructed without written approval from City prior to start of such excavation work. Principal Project Company shall retain a Certified Arborist as needed to provide written direction at Principal Project Company's expense.

b. When excavating or trenching within the canopy of trees to remain, the Planning Department will be given 48 hours' notice.

c. Trenching within the canopy of trees may not proceed without a professional arborist present to perform compensatory root and branch pruning.

d. Principal Project Company shall place all piping 3 ½-inches and smaller and all conduits a minimum of 18-inch below the existing finished grade. New conduits shall be located at least 25-feet away from all tree trunks, 20-feet away from all buildings, 10-feet away from any pathway lighting, and 5 feet away from and parallel to any asphalt or concrete paths.

e. Principal Project Company shall place all piping 4-inches and larger a minimum of 3-feet below the existing finished grade except when approved by the City Planning Department to clear root systems. In no case shall the 4-inch or larger pipe be placed less than 2-feet below the finished grade.

f. Principal Project Company shall bend and/or transition underground conduit and piping so that the conduit or piping will thread between tree roots.

g. When possible, trenches shall not be run of the side of the tree exposed to prevailing winds as roots are primarily anchored on the windward side. Trenches shall not be cut across more than one quadrant of the tree root zone.

h. In areas where trenching is required under low hanging tree branches (8 to 12-feet off the ground), Principal Project Company shall operate equipment to a maximum height of 10-feet to avoid contact and possible damage to the tree branches.

i. Piping and conduit trenching work shall include the use of machinery that will not extend above 10-feet vertically for 5% of the linear trenching performed.

j. Trenching to a maximum of 3-feet as measured horizontally may be executed without written approval from the City Planning Department for the placement of pipe fittings and quick couplers at any location outside the drip line of any tree.

9. Trees to be preserved within the Work area shall be protected by Principal Project Company as follows:

a. 6-foot tall temporary tree protection composed of 2x4s shall be constructed to surround the outer edge of the tree basin.

b. 2x4s shall be mounted on 2-inch diameter galvanized iron posts, which shall be anchored into the soil on opposite corners of the guard and driven into the ground to 2-foot depth, avoiding any roots greater than 2-inches in diameter.

c. 2x4s shall be installed as a toe board surrounding the base of the tree protection for ADA compliance.

d. Orange snow fencing shall be placed around the tree protection.

e. Refer to Appendix 'A' for additional information.

10. Principal Project Company shall install on all trees within a band extending six feet past the limits of the Construction Work hay bales or rolls of erosion control wattling, secured around trunk to a height of 6 feet, or as otherwise directed by City.

E. Principal Project Company is in informed that San Francisco is a Quarantine County for the Sudden Oak Death pathogen *Phytophthora* and that where trees of the following species are known by Principal Project Company to be removed, or marked on the plans as intended for removal, by grubbing or otherwise, or pruning -- Coast Live Oak (*Quercus agrifolia*), Canyon Live Oak (*Quercus chrysolepis*), California Black Oak (*Quercus kelloggii*), Shreve's Oak (*Quercus parvula* var. *shrevei*), Tanoak (*Notholithocarpus densiflorus*), California bay laurel (*Umbellularia californica*) -- the following precautionary measures against the spread of *Phytophthora* will apply.

1. Plants of species that may harbor *Phytophthora* shall be chipped on site and the chips spread at the location of the same trees and/or shrubs that produced the debris. This plant debris may not be used for any purpose at any other location.

2. If spreading on site is not possible, materials shall be disposed of in landfill or at an industrial-scale composting facility. Principal Project Company shall provide documentation of such disposal to the City Planning Department.

3. For sites identified as potentially harboring *Phytophthora*, Principal Project Company shall ensure that the following actions are performed:

a. All workers scrape, brush, and/or hose off accumulated soil and mud from clothing, gloves, boots, and shoes before leaving the site.

b. Mud and plant debris are removed by blowing out or power washing chipper trucks, chippers, bucket trucks, fertilization and soil aeration equipment, cranes, and other vehicles before leaving the site.

c. Soil and mud are removed or washed off from on vehicle tires, boots, shovels, stump grinders, trenchers, etc., before use at another site.

d. Tools used in tree removal/pruning are disinfected with Lysol® spray, a 70% or greater solution of alcohol, or a solution consisting of 1 part household bleach to 9 parts water before leaving the site.

3.15 SITE RESTORATION

A. Principal Project Company shall furnish all material, labor, equipment, and service necessary to revegetate disturbed areas whose surface is not otherwise converted to gravel, pavement, new landscaping as indicated on plans, or new facilities.

B. Principal Project Company shall strip and dispose of at an offsite location the top three inches of soil from work areas where soil will be left exposed after the conclusion of Construction Work. Any remaining topsoil below this depth up to 12 inches deep generated during site grading and/or excavation shall be stockpiled separately onsite for reuse during revegetation. All topsoil stockpiles shall be covered with plastic and labeled while stored onsite to avoid improper use or disposal.

C. Principal Project Company shall ensure that any imported fill material, soil amendments, gravel etc., required for construction and/or restoration activities that would be placed in the upper 12 inches of the ground surface are free of vegetation and plant material. Certified, weed-free, imported erosion-control materials (or sterile rice straw in upland areas) shall be used exclusively.

D. Revegetation

1. Principal Project Company shall ensure that all seed complies with the California Seed Law of the Department and Agriculture. Seed materials shall meet all applicable inspections required by law. No non-native or invasive species shall be used in any restoration seeding.

2. Principal Project Company shall ensure that all seeding occurs between September 15 and December 15 unless otherwise approved by City.

3. Prior to hydroseeding, Principal Project Company shall prepare disturbed areas whose surface is not otherwise converted to gravel, pavement, or new facilities as seed beds, including:

    a. Scarifying and decompacting soils to a depth of no less than 12 inches; and

    b. Removing rocks greater than ½ inch and removing weeds; and

    c. Restoring stockpiled topsoil; and

    d. Incorporating sufficient compost to restore the area to original grade after having been trackwalked. Compost producers must be permitted by the Department of Resources Recycling and Recovery, Local Enforcement Agencies, and any other State and local agencies that regulate solid waste plants. If exempt from State permitting provisions, the composting plant must certify it complies with the guidelines and procedures for production of compost under 14 CA Code of Regs § 17868. Compost producers must be participants in the United States Composting Council's seal of testing assurance program.

4. Principal Project Company shall ensure that commercially obtained seed is labeled according to State and federal laws, under the California Food and Agricultural Code, and by the vendors supplying the seed. Seed shall be delivered to the Project Site in unopened supplier’s sealed containers bearing original certification labels and the seed tag attached. Containers opened prior to inspection or without a label or tag shall not be accepted. Each seed bag shall be delivered to Project Site sealed and clearly marked as to the species, purity, percent germination, weed seed, inert material, dealer’s guarantee, and date of test.

5. Principal Project Company shall store seed in a cool dry location away from moisture and contaminants. Seed materials shall be stored on site for no longer than two weeks. All storage locations shall be subject to written approval by City.

6. Principal Project Company shall ensure that seed is State-certified of the latest season's crop. Seed shall be delivered in original sealed packages bearing producer's guaranteed analysis for purity, germination, weed seed content, and inert material. Seed bags shall include manufacturer's tags in conformance with AMS Seed Act and applicable State laws. Wet, moldy, or otherwise damaged seed will be rejected by City.

7. Principal Project Company shall ensure that seed has been tested for purity and germination not more than (15) fifteen months prior to the application of the seed.

8. Principal Project Company shall ensure that seed is stock origination from within the San Francisco Bay Area Counties (San Francisco, San Mateo, Santa Cruz, Santa Clara, Alameda, Contra Costa, Solano, Napa, Sonoma, Marin). Seed suppliers include Pacific Coast Seed, Livermore, CA (925) 373 4417; Larner Seed, Bolinas, CA (415) 868 9407; Hedgerow Farms, Winters, CA (530) 662-6847; and others.

9. Principal Project Company shall ensure that the minimum quantity of seed to be applied is in the quantities for each species (in pounds per acre) recommended by the seed supplier, mixed proportionally, which must be stated on the supplier's original label(s) on the original sealed packages.

10. Principal Project Company shall ensure that seed mix is as specified in column A "SEED MIX", below. If one or more species of grass, wildflower, and/or subshrub is not readily available, Principal Project Company may substitute a species of grass, wildflower, and/or subshrub from column B "SUBSITUTIONS" below. For linear areas of restoration, such as may be required to restore areas following trenching, less than 4' in width, subshrub species may be omitted. Other modifications to the seed mix may be made if approved by City. Principal Project Company shall allow at least 14 working days for written approvals to modifications to the seed mix.

11. Principal Project Company shall ensure that seed is a minimum of 70 percent Pure Live Seed and 80 percent Germination unless otherwise approved in advance by City.

E. SEED MIX

1. SEED MIX

Achillea millefolium (Yarrow, wildflower)

Acmispon glaber (deerweed, subshrub)

Artemisia californica (California sagebrush, subshrub)

Bromus carinatus (California brome, grass)

Elymus glaucus (Blue wildrye, grass)

Eschscholzia californica (California poppy, wildflower)

Festuca microstachys (Small fescue, grass)

Hordeum brachyantherum (California meadow barley, grass)

Lupinus bicolor (annual lupine, wildflower)

Stipa pulchra (Purple needlegrass, grass)

2. SUBSTITUTIONS

Chlorogalum pomeridianum (amole, soap plant, wildflower)

Diplacus aurantiaca (sticky monkeyflower, wildflower)

Eriogonum nudum (Naked buckwheat, subshrub)

Grindelia stricta var. *platyphylla*, (beach gum daisy, wildflower)

Hordeum brachyantherum (California meadow barley, grass)

Iris douglasiana (Douglas iris, wildflower)

Lupinus microcarpus (chick lupine, wildflower)

Phacelia californica (California phacelia, wildflower)

Scrophularia californica (California bee plant, wildflower)

Trifolium ciliolatum (foothill clover, wildflower)

Trifolium wormskioldii (cow clover, wildflower)

F. Principal Project Company shall ensure that tackifier is applied as part of the hydroseed slurry if hydroseed method is employed. If broadcast seeding method is employed, tackifier or sterile straw may be applied after seeding. Principal Project Company shall comply with the following:

1. Mixing shall be performed in a tank with a built-in, continuous agitation and recirculation system of sufficient operating capacity to produce a homogeneous slurry and a discharge system that will apply the slurry at continuous and uniform rate. The tank shall have a minimum working capacity of 700 gallons. City may authorize in writing the use of equipment of smaller capacity if it is demonstrated that such equipment is capable of performing all the operations satisfactorily. Mixing shall be performed in the presence of Principal Project Company's QC Manager and City. Principal Project Company shall submit bags of materials used in the mix to City.

2. Water, fiber, stabilizing emulsion and other ingredients except seed shall be added to the tank simultaneously so that the finished load is a homogeneous mix of the specified ingredients. Seed shall be added last and shall be discharged within 1 hour. If mixture remains in tank for more than 1 hour, it shall be removed from the job site and replaced at Principal Project Company's expense. Once fully loaded, the slurry shall be agitated for 5 minutes to allow for uniform and thorough mixing. The slurry shall have the proper consistency to adhere to the soil even on slopes without clumping or running. Slurry shall be uniformly applied in a sweeping motion under pressure over the entire designated area to form a mat. The hydroseeded area shall not be rolled.

3. Seed and tackifier shall be applied to the disturbed areas in one operation at rates of 50 pounds per acre and 90-120 pounds per acre, respectively. At all times, materials shall be kept uniformly mixed in the hydromulcher tank during the application operation.

G. For areas greater than 2,500 sq feet, Principal Project Company shall utilize hydroseeding, but for areas under 2,500 sq feet, Principal Project Company shall broadcast seed, rake in the seed in two directions and cover with 1 inch layer of compost.

3.16 NOT USED

3.17 HUMAN REMAINS

A. If the body of a deceased human being in any stage of decomposition or completeness is encountered, all work in the area must halt and the San Francisco County Coroner must be contacted, pursuant to California Public Resources Code Sections 5097.98, and 5097.99.

3.18 ARCHAEOLOGICAL RESOURCE PROTECTION

A. Prior to issuance of construction permits, Principal Project Company shall have an Archeological Monitoring Plan reviewed and approved by City Planning Department. Principal Project Company shall ensure compliance with the approved Archeological Monitoring Plan which shall govern for the associated construction activities as stated in the approved plan.

B. Any soil disturbing activities below a depth of two feet below ground surface by Principal Project Company shall be preceded by the distribution by Principal Project Company of the San Francisco Planning Department archeological resource “ALERT” sheet to any Principal Project Company Contractor or Subcontractor (including demolition, excavation, grading, foundation, pile driving, etc. firms); or Utility involved in soil disturbing activities within the Project Site, and all field personnel, including machine operators, field crew, pile drivers, supervisory personnel, etc..

1. Following the distribution of the “ALERT” sheet, Principal Project Company shall provide City with a signed affidavit confirming that all field personnel have received copies of the “ALERT” sheet.

    a. The “Alert” sheet and affidavit are available for download at: https://www.sfpublicworks.org/services/project-manual-and-reference-documents

2. If potential subsurface archaeological resources are discovered at the site, Principal Project Company shall promptly report their discovery to City. Subsurface archaeological finds may include any of the following:

    a. Concentrations of shellfish remains

    b. Evidence of fire (ashes, charcoal, burnt earth, fire-cracked rocks)

    c. Concentrations of bones

    d. Recognizable Native American artifacts (arrowheads, shell beads, stone mortars (bowls), humanly shaped rock)

    e. Building foundation remains

    f. Trash pits

    g. Privies (Out-house holes)

    h. Floor remains

    i. Wells

    j. Concentration of bottles, broken dishes, shoes, buttons, cut animal bones, hardware, household items, barrels, etc.

    k. Debris from the Great 1906 Earthquake and Fire (thick layers of burned building debris, charcoal, nails, fused glass, burned plaster, burned dishes, etc.)

    l. Wood structural remains (building, ship, wharf, etc.)

m. Clay roof/floor tiles

n. Stone walls or footings

o. Gravestones

3. City will issue a written order to suspend work directing Principal Project Company to cease all Construction Work only at the location of the potential cultural resources find to allow City to assess the significance of the find.

4. Principal Project Company shall comply with all applicable Laws and any additional avoidance and minimization measures specified by City to minimize potential effects on cultural resources, which may include additional site security.

C. Where any soil-disturbing activity below the depth specified in paragraph 3.18(B)(1) below is to occur within an area noted and depicted on the Design Documents as an area of particular archaeological sensitivity for which monitoring is required, a Specialty Environmental Monitor – Archaeologist, provided by Principal Project Company, shall be present to conduct monitoring for the presence of potential archaeological resources. Principal Project Company shall comply with the following:

1. Archaeological monitoring is required for any ground disturbance below 2 feet of the existing ground (paved or unpaved) surface.

2. Principal Project Company shall be responsible for confirming that the required Specialty Environmental Monitor – Archaeologist is on-site as required prior to performing said work.

3. The Specialty Environmental Monitor – Archaeologist may order Principal Project Company to cease Work if a potential archaeological resource is detected. The Principal Project Company shall notify City immediately of such order. The Principal Project Company shall cease all construction operations only at the location of the potential archeological resource find to allow City to assess the significance of the find.

4. Principal Project Company shall comply with all applicable Laws and any additional avoidance and minimization measures specified by City to minimize potential effects on archeological resources, which may include additional site security. Principal Project Company is advised that the discovery of unique archaeological resources may entail extended periods of work suspension.

3.19 HISTORIC CULTURAL RESOURCE PROTECTION

A. Principal Project Company shall protect historic resources shown and labeled in the Design Documents and Reference Documents that are adjacent to, or in the right-of-way adjacent to or occupied by, the Project, including:

1. Not used.

2. All distinctive sidewalk elements, such as brick surfacing, brick gutters, granite curbs, cobblestones, non-standard sidewalk scoring and streetscape elements such as terrazzo finishes, sidewalk lights, and special sidewalk finishes that appear to be 45 years or older are potential historic resources and shall be protected in place, salvaged and re-installed, or replaced in kind to match the character of the existing condition as shown in the Design Documents or Reference Documents and/or found in place. Principal Project Company shall avoid damaging and protect in place any features described above and shall notify City of any feature not identified in the Design Documents that is in conflict with the proposed Work.

B. Principal Project Company shall comply with San Francisco Public Works Orders for the restoration of granite (granodiorite) curb in historic districts and the preservation of existing granite curb and existing surficial bricks and cobblestones, and shall comply with the following:

1. Compliance information shown in the Contract Documents:

    a. All existing granite curb, and existing surficial bricks and cobblestones, within the area of proposed curb-and-gutter work is shown on the Project construction drawings.

    b. The areal extent of All National Register of Historic Places historic districts, California Register of Historical Resources historic districts, and historic districts as identified by San Francisco Planning Code Articles 10 and 11 districts, for which the period of historic significance is coeval with the period of use of granite as a curb material by the City of San Francisco is shown on the project construction drawings.

    c. The Principal Project Company is hereby informed that the following limits of Work are located within a historic district as shown in the Design Documents:

        1) None

2. Except as noted below, all linear sections of curb, including driveways, within the Project limits within the limits of a historic district, regardless of existing condition, shall be restored using granite salvaged during demolition of the existing curb, supplemented with replacement granite sections, regardless of whether the curb line has moved.

    a. Granite curb within the boundaries of a historic district shall only be replaced with concrete curb for new curb ramp radius construction, or as part of new linear and radius curb sections of new curb corner extensions installed for traffic calming (“bulb-outs”).

    b. A corner extension that extends for longer than the minimum distance required for the installation of corner ADA curb ramps is considered sidewalk widening; such sections shall require the installation of granite curb.

    c. No granite, cobblestones, or brick gutter shall be restored within a pedestrian accessible route (PAR) (see San Francisco Public Works Order No: 200369).

3. Any granite curb section not within a historic district shall be salvaged and reset in the location from which it was salvaged. If the curb line is moved as a result of the Project, the salvaged granite curb shall be reset parallel to its previous location. Salvaged granite curb is not required to be used on new linear and radius curb sections of new curb corner extensions ("bulb-outs") and may not be reused within a PAR.

4. Granite curb shall be installed in sections a minimum of 4-feet in length. If a section of granite to be replaced or restored is less than 4’ long, then the scope of Work must be expanded so that the minimum length of any single length of granite installed by Principal Project Company or extant and retained in position is a minimum of 4’ long.

5. City stockpiles of salvaged granite curb, when available, are made available to Principal Project Company upon application to the relevant department.

6. Specifications for new granite curb are as follows:

    a. Material: Stone curb shall be made from granite, free from defects or flaws that might impair its usefulness as curb.

b. Dimensions: Each piece of curb shall be at least 4 feet long, 6 inches thick at top and bottom, and 16 inches deep.

c. Dressing: The top of the curb and its face for a depth of 6 inches shall have a first-class peen-hammered finish. These surfaces shall be true and properly squared and have no holes. A tolerance of 1/4 inch will be allowed in width of top of curb. The back of the curb, for a depth of 2 inches, shall be pointed to a fair surface, free from inequalities exceeding 1/2 inch, when measured from a straight edge. The joints of the curb shall show an even edge for a depth of 8 inches and will be kept full. The joints below the dressed portion shall not be pitched more than 1/4 inch under square. The joints throughout the dressed portion of the ends shall not exceed 1/4 inch. All edges bordering dressed surfaces shall be sharply defined.

d. Where gutters are deeper than 6 inches, the face of the granite curb shall be peen-hammered to the full depth of the gutter. The lower part of each stone shall be roughly squared and shall have an average thickness of not less than 6 inches at the bottom and at no point shall the thickness be less than 4 inches.

e. The curb for corners shall be cut to the prescribed curved lines, with joints on true radial lines. The joints between the several blocks of stones shall not exceed 1/8 inch.

f. Previously salvaged granite curb that meets the above specification is acceptable.

7. Except as noted above (PAR, bulb-outs), existing brick gutter shown on drawings shall be salvaged and reset in its original location, and existing surficial cobblestones shall be salvaged and reset in their original location.

   a. City stockpiles of salvaged brick will be made available to Principal Project Company if available upon application to the relevant department. New replacement gutter brick shall be brick of approximately the same dimensions and approximate color of the existing brick and shall conform to ASTM standard specification C1272 − 17 for Heavy Vehicular Paving Brick Type R as well as meet criteria set forth in San Francisco Public Works guidance for slip resistance.

   b. Other than brick gutter to be replaced/restored, no brick or cobblestone surfacing may be removed from the surface of the travel way without prior written approval by City.

8. Principal Project Company shall exercise care to minimize damage in transporting salvaged granite curb, brick, and cobblestones that Principal Project Company is returning to City.

   a. Minimum size of cobblestone that may be returned is 4 inches square (16 square inches). Bricks to be returned must be whole.

   b. Principal Project Company shall neatly and securely place the granite curb on pallets so it can be moved about safely after delivery. The cobblestones and/or brick shall be neatly and securely placed on pallets so they can be moved about safely after the delivery.

   c. The salvaged granite curb, bricks, and cobblestones that will not be reset shall be delivered, including off loading, to a storage site within the City. Principal Project Company shall provide a minimum of forty-eight (48) hours prior notice of delivery, and delivery is limited to Monday through Friday 8:00 a.m. to 2:00 p.m. Principal Project Company shall provide a forklift for unloading.

d. Prior to transporting, Principal Project Company shall ensure that the brick and/or cobblestones are cleaned of dirt, grout and/or concrete. Principal Project Company shall take care during the transporting of the brick and cobblestones to minimize damage before delivery to City.

C. NOT USED

3.20 SAN FRANCISCO ENVIRONMENT CODE CLEAN CONSTRUCTION REQUIREMENTS FOR WORK IN AN AIR POLLUTANT EXPOSURE ZONE (APEZ)

A. Principal Project Company is informed that as the Project will use off-road powered construction machinery and is projected to last longer than 19 days, the following additional requirements of San Francisco Environment Code Chapter 25 apply. These requirements may be waived by the City Planning Department at the Contractor's request if the City Planning Department determines the absence of sensitive uses as defined by the Environment Code within 1,000-feet of the project construction limits as shown on the project drawings and/or if the project requires a limited amount of Off- Road Equipment for a limited duration.

B. Reference section 3.06.A and 3.06.B of this specification regarding equipment engine emissions standards, sources of power, and waivers.

C. Principal Project Company shall submit a Construction Emissions Minimization Plan (CEMP) to the City Planning Department for review and written approval for compliance with Chapter 25 of the San Francisco Environment Code.

D. Principal Project Company shall submit its initial CEMP no less than 28 days prior to mobilization. The CEMP will state, in reasonable detail, how the Principal Project Company shall meet the requirements of Section 2505 of the Environment Code.

1. The CEMP shall include estimates of the construction timeline by phase, with a description of each piece of off-road equipment required for each Construction Phase.

2. The description shall include equipment type, equipment manufacturer, equipment identification number, engine model year, engine certification (Tier rating), horsepower, engine serial number, and expected fuel usage and hours of operation.

3. For the VDECS installed, the description shall include technology type, serial number, make, model, manufacturer, CARB verification number level, and installation date and hour meter reading on installation date.

4. For off-road equipment using alternative fuels, the description shall also specify the type of alternative fuel.

5. Principal Project Company may use the Clean Construction Equipment Inventory Template to satisfy the CEMP requirements. Refer to the following link for that template: https://www.sfdph.org/dph/EH/Air/CleanConstruction.asp

E. Principal Project Company agrees to comply fully with the CEMP and acknowledges that a significant violation of the CEMP will constitute a material breach of the Agreement. Principal Project Company must submit a signed CEMP Certification Statement to the City Planning Department. Refer to the following link for the Emissions Plan Certification Statement Template: https://www.sfdph.org/dph/EH/Air/CleanConstruction.asp.

F. After City Planning Department review and written approval, Principal Project Company shall make the CEMP available to the public for review onsite during working hours.

G. Principal Project Company shall post at the construction site a legible and visible sign summarizing the CEMP. Refer to the following link for the Clean Construction Sign Template: https://www.sfdph.org/dph/EH/Air/CleanConstruction.asp.

1. The sign shall also state that the public may ask to inspect the CEMP for the project at any time during working hours and will explain how to request to inspect the CEMP.

2. Principal Project Company shall post at least one copy of the sign in a visible location on each side of the construction site facing a public right-of-way.

H. Principal Project Company shall submit quarterly and biannual reports to City Planning Department documenting compliance with the CEMP within seven business days of the end of each quarter.

I. Principal Project Company shall submit a final CEMP report within four weeks of achieving Substantial Completion summarizing compliance of the Construction Work with the CEMP, including the start and end dates and duration of each Construction Phase

J. The San Francisco Public Works Director may waive requirements of Chapter 25 of the Environment Code on the grounds set forth in Section 2507 of the Environment Code at the request of Principal Project Company, if such request is submitted to the City Planning Department

1. For any waiver granted, the City Planning Department will within two business days prepare a written notice of the waiver and a written memorandum explaining the basis for the waiver and the steps that will be taken to safeguard public and City employee health during the noncomplying work. The memorandum will also state the requirements subsequently imposed upon the contractor to minimize the use of noncomplying equipment or engines during the noncomplying work.

2. Requests for such waivers must be provided to the City Planning Department no fewer than two weeks prior to the planned implementation of the waiver and must be accompanied by conclusive substantiating information. Waivers are granted at the sole discretion of the San Francisco Public Works Director. The City will provide no compensation to the contractor for any consequences of the denial of a waiver request.

3.21 CONSTRUCTION SITE RUNOFF CONTROL PERMIT

A. Principal Project Company shall obtain a Construction Site Runoff Control Permit from the San Francisco Public Utilities Commission, Wastewater Enterprise, Collection System Division (SFPUC-WWE/CSD).

1. The Construction Site Runoff Control Permit Application shall include an Erosion and Sediment Control Plan (ESCP) developed signed and stamped by a Qualified Stormwater Pollution Prevention Plan Developer or Practitioner (QSD or QSP). The Erosion and Sediment Control Plan shall include a vicinity map showing the location of the Project Site in relationship to the surrounding area's water courses, water bodies, and other significant geographic features; a site survey; suitable contours for the existing and proposed topography, area drainage, proposed construction and sequencing, proposed drainage channels; proposed erosion and sediment controls; dewatering controls where applicable; soil stabilization measures where applicable; maintenance controls; sampling, monitoring, and reporting schedules; and any other information deemed necessary by the SFPUC.

a. A SWPPP for which a WDID has been issued will be accepted in lieu of an ESCP.

B. Principal Project Company shall submit the Construction Site Runoff Control Permit Application within (30) thirty calendar days after NTP 2 for review and approval by City. Principal Project Company is responsible for obtaining the Construction Site Runoff Control Permit in a timely manner and prior to the commencement of any land-disturbing activities.

1. Concurrent with the approved ESCP, Principal Project Company shall provide City with a checklist for City's written approval prepared and stamped by the QSD or QSP listing all requirements of the ESCP.

C. Principal Project Company shall not commence demolition or earthmoving activities until City has verified ESCP implementation.

1. If required by the terms of the Construction Site Runoff Control Permit, or at the request of City, Principal Project Company shall also provide a QSD or QSP to verify ESCP implementation to the satisfaction of City.

D. At least two working days before each the following milestones, Principal Project Company shall provide the SFPUC with a transmittal, with a copy to City, to inform the SFPUC inspector that the following are about to occur:

1. Commencement of Construction Work.

2. Erosion and sediment control measures are completely installed and stabilized.

3. Final grading has been completed.

4. Substantial Completion.

E. Principal Project Company shall maintain a copy of the Construction Site Runoff Control Permit and Erosion and Sediment Control Plan onsite at all times.

F. Principal Project Company shall daily inspect, maintain, and repair all graded surfaces and erosion and sediment controls, drainage structures, and other protective devices, plantings, and ground cover installed while construction is active.

G. Every person who operates any erosion and sediment control or controls must provide analytical inspection and maintenance information as set forth in the Construction Site Runoff Control Permit.

1. Unless otherwise specified by the terms of the Construction Site Runoff Control Permit, the QSP/QSD or personnel trained by the QSP/QSD will use City -approved checklist to document weekly visual inspections to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended.

2. Principal Project Company shall keep all completed inspection checklists and related documentation with the ESCP on-site or electronically and transmit copies of the previous month's checklists to City on the first business day of each month during project construction accompanied by a certification under penalty of perjury that such information is accurate and true.

H. Principal Project Company shall permit City and/or representatives of the SFPUC to perform inspections as may be deemed necessary.

I. Principal Project Company shall provide devices or locations necessary to conduct sampling or metering operations, if required by the terms of the Construction Site Runoff Control Permit and/or requested by City.

1. If effluent water-quality monitoring is required by the Construction Site Runoff Control Permit, sampling must be performed by a QSD, QSP, or persons trained by the QSP. pH and turbidity may be assessed using field meters; all other parameters will require laboratory analysis unless an exception is approved by City. Monitoring reporting shall be as prescribed in the project Construction Site Runoff Control Permit.

J. Principal Project Company's QSD shall (i) immediately inform City in the event that Project Change Orders or other change in construction conditions alters the implementation of the ESCP, (ii) update the ESCP to address changes affecting construction site-runoff management, and (iii) submit the revised ESCP to the SFPUC. Principal Project Company shall implement the revised ESCP as soon as feasible after acceptance by the SFPUC. Principal Project Company shall immediately communicate any additional modifications to the ESCP requested by the SFPUC to the City Planning Department and the City

3.22 NOT USED

3.23 CITY WATER-QUALITY PERMITTING

A. Well Construction/Decommissioning or Soil Borings Permit: Before conducting soil boring or constructing a well, Principal Project Company must obtain a permit issued by SFDPH to construct or operate an environmental or geotechnical well or soil boring.

1. These wells include, but are not limited to, cone penetrometers, inclinometers, piezometers, cathodic wells, exploratory wells, extraction wells, recovery wells, monitoring wells, temporary wells, irrigation wells, industrial wells, dewatering wells, wick drains, hydropunch soil borings, and soil borings drilled for geotechnical or environmental purposes (whether or not groundwater is encountered). This information is not intended as a substitute for familiarity with applicable Laws and regulations.

2. Principal Project Company shall use a driller with a C-57 state license.

3. Principal Project Company shall contact the SFDPH Environmental Health Branch, Monitoring Well Section at least 15 Working Days in advance of drilling at (415) 252-3800.

B. Underground Storage Tank (UST) Permit: Before modification, repair, removal and/or installation of fuel or chemical storage tanks, Principal Project Company shall obtain the written approval of the SFDPH, in compliance with Articles 21, 21A and 22 of the San Francisco Public Health Code, and its implementing regulations, compliance with applicable provisions of Chapters 6.7 and 6.75 of the California Health and Safety Code, Section 25280 et al. Contact the SFDPH Environmental Health Branch, HMUPA at (415) 252-3800.

1. If UST(s) are unexpectedly encountered during the course of construction, Principal Project Company shall stop Work at the site of the UST and alert City.

3.24 EMERGENCY OR BACKUP DIESEL GENERATOR HEALTH RISK REDUCTION PLAN

A. The Principal Project Company shall comply with the following:

1. Require all emergency or backup diesel generators to meet Tier 4 Final emission standards, reduce annual testing limit to 20 hours per year for each generator; or

2. Require all emergency or backup diesel generators to be battery-powered; or

3. Retain a qualified air quality consultant to develop a Diesel Generator Health Risk Reduction Plan. The Principal Project Company shall submit the plan to City Planning Department for review and approval prior to issuance of a permit for emergency diesel generators from the San Francisco Department of Building Inspection or the Bay Area Air

Quality Management District. The plan must include, for each diesel generator, a description of the anticipated venting location, engine specifications, and annual maintenance testing procedures. The plan must demonstrate with substantial evidence that annual maintenance testing will not result in the project's overall construction and operational cancer risk exceeding 7 per one million persons exposed at nearby offsite sensitive receptors.

B. Principal Project Company shall be required to maintain records of the testing schedule for each diesel generator for the life of that generator and to provide this information for review to City Planning Department within three months of requesting such information.

3.25 FIXED MECHANICAL EQUIPMENT NOISE CONTROL FOR BUILDING OPERATIONS

A. Prior to approval of a building permit, the Principal Project Company shall submit documentation to City Planning Department, demonstrating with reasonable certainty that the building's fixed mechanical equipment (such as heating, ventilation and air conditioning [HVAC] equipment):

1. Meets the noise limits specified in sections 2909 (b) and 2909 (d) of the noise ordinance (i.e., an 8-dB increase above the ambient noise level at the property plane for commercial or mixed-use properties; and

2. Interior noise limits of 55 dBA and 45 dBA for daytime and nighttime hours inside any sleeping or living room in a nearby dwelling unit on a residential property assuming windows open, respectively).

3. Acoustical treatments required to meet the noise ordinance may include, but are not limited to:

4. Enclosing noise-generating mechanical equipment; and

5. Installing relatively quiet models of air handlers, exhaust fans, and other mechanical equipment; and

6. Using mufflers or silencers on equipment exhaust fans; and

7. Orienting or shielding equipment to protect noise-sensitive receptors (residences, hospitals, convalescent homes, schools, churches, hotels and motels, and sensitive wildlife habitat) to the greatest extent feasible; and

8. Increasing the distance between noise-generating equipment and noise- sensitive receptors; and/or

9. Placing barriers around the equipment to facilitate the attenuation of noise.

B. Compliance with this fixed-mechanical equipment noise control for building operations standard requirement does not obviate the need for the equipment to demonstrate compliance with the noise ordinance throughout the lifetime of the project.

3.26 DESIGN MEASURES TO REDUCE PROJECT SPECIFIC WIND IMPACTS

A. The project sponsor team shall implement as many of the design measures identified in the wind impact mitigation report as needed to reduce the proposed project's or project variants' potential to create a new wind hazard or exacerbate an existing wind hazard in publicly accessible areas of substantial pedestrian use to less-than-significant levels, such as:

1. porous facades on portions of the north, east and west sides for natural ventilation as part of the heating, ventilation, and air conditioning strategy for the new transit facility at the second and third levels; and

2. recessed building corner up to 12 feet in height at the southwest corner of proposed building near Bryant Street and Mariposa Street intersection; and

3. vertical elevated screens on portions of the second and third levels of the west façade; and

4. vertical wind screens at grade level on the adjacent Bryant Street sidewalk near the Bryant Street and Mariposa Street intersection; and

5. additional on-site landscaping or off-site streetscape improvements and wind screens.

B. If changes to the building design or massing are proposed after certification of the Final Environmental Impact Report,

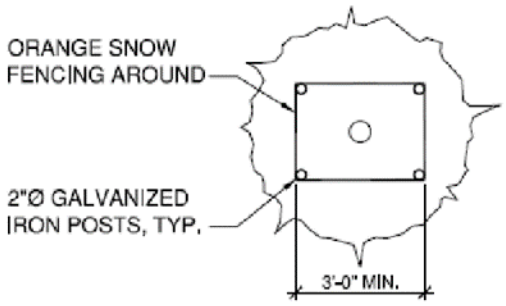
1. additional wind analysis may be required to confirm the modified design does not result in any 9-hour wind hazard exceedances and to minimize 1-hour wind hazard exceedances.

2. If City Planning Department determines that the modified design could result in wind hazard criterion exceedances (for example, due to the removal of one or more wind reducing features), the Principal Project Company shall retain a qualified wind consultant to prepare a wind analysis under the direction of the City Planning Department. The wind analysis may require a wind tunnel test and shall identify wind reduction measures needed to avoid 9-hour wind hazard exceedances and to minimize 1-hour wind hazard exceedances.

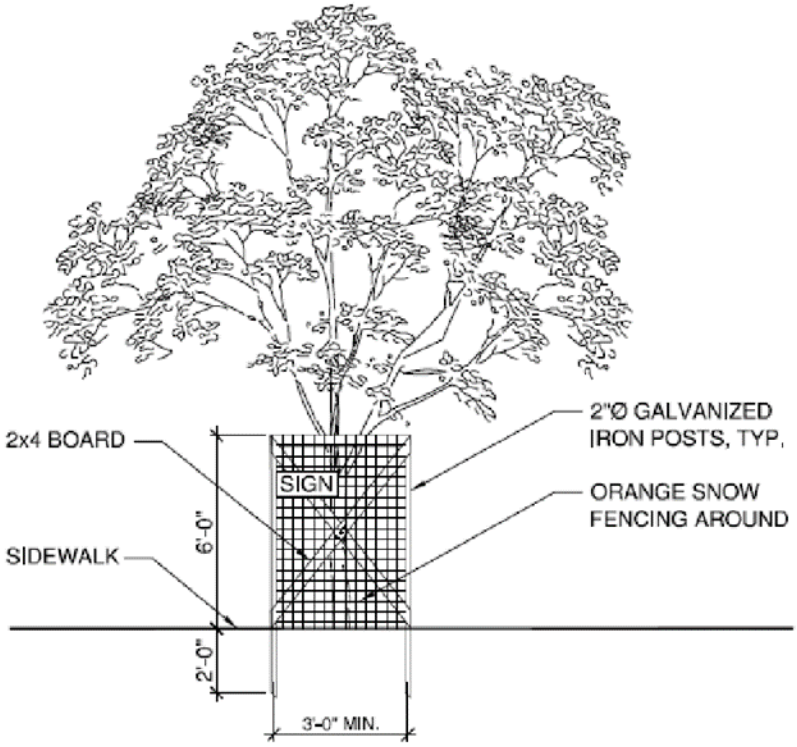
C. The final wind impact mitigation report should not find that the project produces a net increase of the already identified wind hazard exceedances. City Planning Department shall approve the final list of wind reduction measures that the project sponsor team shall implement.

END OF SECTION

APPENDIX A (01 35 43): SAMPLE TREE PROTECTION STREET TREE



PLAN VIEW



STREET TREE PROTECTIVE FENCE

SCALE: 1/4" = 1'-0"

APPENDIX B: COMPLETE ENVIRONMENTAL MITIGATION AND MONITORING PLAN

APPENDIX APPLIES TO:
01 35 43
01 35 50

MITIGATION MONITORING AND REPORTING PROGRAM: MITIGATION, IMPROVEMENT & PUBLIC WORKS STANDARD CONSTRUCTION MEASURES

Record No.:	Case No. 2019-021884ENV	Block/Lot:	3971/001
Project Title:	SFMTA Potrero Yard Modernization Project	*Lot Size:*	4.4 acres
BPA Nos:	Submittal pending	*Project Sponsor:*	Chris Lazaro, SFMTA, (415) 549-6572
Zoning:	Public (P) Use District	*Lead Agency:*	San Francisco Planning Department
	65-X Height and Bulk District	*Staff Contact:*	Jennifer McKellar, Planning – (628) 652-7563

Tables 1 and 3 below indicate when compliance with each mitigation and improvement measure must occur. Some mitigation and improvement measures span multiple phases. Substantive descriptions of each mitigation measure's requirements are provided on the following pages in the Mitigation Monitoring and Reporting Program. The San Francisco Municipal Transportation Agency (SFMTA) is the project sponsor and property owner of the project site at 2500 Mariposa Street (Potrero Yard). Together the SFMTA and a private project co-sponsor (developer) are referenced below as the project sponsor team. In addition, pursuant to the May 11, 2023, memorandum regarding Public Works' Authority for project delivery of the Potrero Yard Project and the May 31, 2020, attachment referenced therein, San Francisco Public Works assumes responsibility for environmental compliance, including applicable Standard Construction Measures in Tables 2 and 6 below.

	Period of Compliance			
Table 1: Adopted Mitigation Measure	**Prior to the start of Construction***	**During Construction****	**Post-Construction or Operational**	**Compliance with MM completed?**
Mitigation Measure M-CR-1a: Documentation of Historical Resource	X			
Mitigation Measure M-CR-1b: Salvage Plan	X			
Mitigation Measure M-CR-1c: Interpretation of the Historical Resource	X			
Mitigation Measure M-CR-1d: Oral Histories	X			
Mitigation Measure M-TCR-1: Tribal Cultural Resources Preservation and/or Interpretive Program	X	X	X	
Mitigation Measure M-NO-1: Construction Noise Control	X	X		
Mitigation Measure M-NO-2: Vibration-Sensitive Equipment at 2601 Mariposa Street (KQED Building)	X	X		
Mitigation Measure NO-3: Fixed Mechanical Equipment Noise Control for Building Operations	X		X	

Mitigation Measure M-AQ-1: Off-Road Construction Equipment Emissions Minimization	X	X		
Mitigation Measure M-AQ-3: Emergency Diesel Generator Health Risk Reduction Plan	X		X	
Mitigation Measure M-WI-1: Design Measures to Reduce Project-Specific Wind Impacts	X			
Mitigation Measure M-GE-6a: Inadvertent Discovery of Paleontological Resources	X	X		
Mitigation Measure M-GE-6b: Preconstruction Paleontological Evaluation for Class 3 (Moderate) Paleontological Sensitivity Sediments during Construction	X	X		

*Prior to any ground disturbing activities at the project site.
**Construction is broadly defined to include any physical activities associated with construction of a development project including, but not limited to: site preparation, clearing, demolition, excavation, shoring, foundation installation, and building construction.

	Period of Compliance			
Table 2: Adopted Public Works Standard Construction Measure	**Prior to the start of Construction***	**During Construction****	**Post-Construction or Operational**	**Compliance with SCM completed?**
SCM #1: SEISMIC AND GEOTECHNICAL STUDIES	X	X		
SCM #2: AIR QUALITY	X	X		
SCM #3: WATER QUALITY	X	X		
SCM #4: TRAFFIC	X	X		
SCM #5: NOISE	X	X		
SCM #6: HAZARDOUS MATERIALS	X	X		
SCM #7: BIOLOGICAL RESOURCES	X	X		
SCM #8: VISUAL AND AESTHETIC CONSIDERATIONS, PROJECT SITE	X	X		
SCM #9: CULTURAL RESOURCES	X	X		

*Prior to any ground disturbing activities at the project site.
**Construction is broadly defined to include any physical activities associated with construction of a development project including, but not limited to: site preparation, clearing, demolition, excavation, shoring, foundation installation, and building construction.

(Continues on next page)

	Period of Compliance			
Table 3: Adopted Improvement Measure	**Prior to the start of Construction***	**During Construction****	**Post-Construction or Operational**	**Compliance with Improvement Measure completed?**
Improvement Measure I-TR-A: Construction Management Plan – Additional Measures	X	X		
Improvement Measure I-TR-B: Driveway and Loading Operations Plan (DLOP)			X	

*Prior to any ground disturbing activities at the project site.
**Construction is broadly defined to include any physical activities associated with construction of a development project including, but not limited to: site preparation, clearing, demolition, excavation, shoring, foundation installation, and building construction.

Signatures:

I agree to implement the attached mitigation measure(s) and standard construction measures as described herein as conditions of project approval.

Private Project Co-Sponsor (Developer)

December 22, 2023
Date

Note to project sponsor team: Please contact CPC.EnvironmentalMonitoring@sfgov.org to begin the environmental monitoring process prior to the submittal of your building permits to the San Francisco Department Building Inspection.

(Continues on next page)

MITIGATION MONITORING AND REPORTING PROGRAM

Table 4: MITIGATION MEASURES FOR THE POTRERO YARD MODERNIZATION PROJECT

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
		MONITORING AND REPORTING PROGRAM[1]		
MITIGATION MEASURES AGREED TO BY PROJECT SPONSOR TEAM				
HISTORIC ARCHITECTURAL/CULTURAL RESOURCES				
Mitigation Measure M-CR-1a: Documentation of Historical Resource (HRER Part II, Mitigation Measure 1)				
Prior to issuance of a demolition permit, the project sponsor team shall undertake Historic American Building/Historic American Landscape Survey-like (HABS/HALS-like) documentation of the building features. The documentation shall be undertaken by a professional who meets the Secretary of the Interior's Professional Qualifications Standards for Architectural History, History, or Architecture (as appropriate) to prepare written and photographic documentation of the Potrero Trolley Coach Division Facility. The specific scope of the documentation shall be reviewed and approved by the Planning Department but shall include the following elements: Measured Drawings – A set of measured drawings shall be prepared that depict the existing size, scale, and dimension of the historic resource. Planning Department staff will accept the original architectural drawings or an as-built set of architectural drawings (e.g., plans, sections, elevations). Planning Department staff will assist the consultant in determining the appropriate level of measured drawings. Historic American Buildings/Historic American Landscape Survey-Level Photographs – Either Historic American Buildings/Historic American Landscape Survey (HABS/HALS) standard large-format or digital photography shall be used. The scope of the digital photographs shall be reviewed by Planning Department staff for concurrence, and all digital photography shall be conducted according to the latest National Park Service (NPS) standards. The	Project Sponsor Team and qualified consultant, at the direction of the ERO	Prior to issuance of excavation permit or commencement of construction	Planning Department preservation staff shall review and approve the documentation package	Considered complete upon completion of the Planning Department approved documentation provided to the repositories in their preferred format and the print-on-demand booklet is made available to the public, upon request

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
photography shall be undertaken by a qualified professional with demonstrated experience in HABS/HALS photography. Photograph views for the data set shall include contextual views; views of each side of the building and interior views, including any original interior features, where possible; oblique views of the building; and detail views of character-defining features. All views shall be referenced on a photographic key. This photographic key shall be on a map of the property and shall show the photograph number with an arrow to indicate the direction of the view. Historic photographs shall also be collected, reproduced, and included in the data set. HABS/HALS Historical Report – A written historical narrative and report shall be provided in accordance with the HABS/HALS Historical Report Guidelines. The written history shall follow an outline format that begins with a statement of significance supported by the development of the architectural and historical context in which the structure was built and subsequently evolved. The report shall also include architectural description and bibliographic information. Video Recordation (HRER Part II, Mitigation Measure 3) – Video recordation shall be undertaken before demolition or site permits are issued. The project sponsor team shall undertake video documentation of the affected historical resource and its setting. The documentation shall be conducted by a professional videographer, one with experience recording architectural resources. The documentation shall be narrated by a qualified professional who meets the standards for history, architectural history, or architecture (as appropriate) set forth by the Secretary of the Interior's Professional Qualification Standards (36 Code of Federal Regulations Part 61). The documentation shall include as much information as possible—using visuals in combination with narration—about the materials, construction methods, current condition, historic use, and historic context of the historical resource. This mitigation measure would supplement the				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
traditional HABS/HALS documentation, and would enhance the collection of reference materials that would be available to the public and inform future research. Softcover Book – A Print-on-Demand softcover book shall be produced that includes the content from the historical report, historical photographs, HABS/HALS photography, measured drawings, and field notes. The Print-on-Demand book shall be made available to the public for distribution. The project sponsor team shall transmit such documentation to the History Room of the San Francisco Public Library, San Francisco Architectural Heritage, the Planning Department, and the Northwest Information Center. The HABS/HALS documentation scope will determine the requested documentation type for each facility, and the project sponsor team will conduct outreach to identify other interested groups. All documentation will be reviewed and approved by the Planning Department's staff before any demolition or site permit is granted for the affected historical resource.				
Mitigation Measure M-CR-1b: Salvage Plan (HRER Part II, Mitigation Measure 2)				
Prior to any demolition that would remove character-defining features, the project sponsor team shall consult with the planning department as to whether any such features may be salvaged, in whole or in part, during demolition/alteration. The project sponsor team shall make a good faith effort to salvage materials of historical interest to be utilized as part of the interpretative program.	Project Sponsor Team/qualified preservation consultant at the direction of the ERO	Prior to issuance of construction permits	Planning Department	Considered compete after salvage occur and interpretive program is complete
Mitigation Measure M-CR-1c: Interpretation of the Historical Resource (HRER Part II, Mitigation Measure 4)				
The project sponsor team shall facilitate the development of an interpretive program focused on the history of the project site. The interpretive program should be developed and implemented by a qualified professional with demonstrated experience in displaying information and graphics to the public in a visually interesting	Project Sponsor Team, construction contractors, and qualified consultant, at the	Prior to issuance of excavation permit or commencement of construction	Planning Department preservation staff shall review and approve the interpretive program plan	Considered complete upon the Planning Department's approval and the Project Sponsor Team's implementation of the interpretive program plan

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
manner, such as a museum or exhibit curator. This program shall be initially outlined in a proposal for an interpretive plan subject to review and approval by Planning Department staff. The proposal shall include the proposed format and the publicly-accessible location of the interpretive content, as well as high-quality graphics and written narratives. The proposal prepared by the qualified consultant describing the general parameters of the interpretive program shall be approved by Planning Department staff prior to issuance of the architectural addendum to the site permit. The detailed content, media, and other characteristics of such an interpretive program shall be approved by Planning Department staff prior to issuance of a Temporary Certificate of Occupancy. The interpretative program shall include but not be limited to the installation of permanent on-site interpretive displays or screens in publicly accessible locations. Historical photographs, including some of the large-format photographs required by Mitigation Measure M-CR-1a, may be used to illustrate the site's history. The oral history program required by Mitigation Measure M-CR-1d will also inform the interpretative program. The primary goal is to educate visitors and future residents about the property's historical themes, associations, and lost contributing features within broader historical, social, and physical landscape contexts. These themes would include but not be limited to the subject property's historic significance for its association with the earliest years of San Francisco's Municipal Railway, the United States' first publicly owned street railway and for its distinctive characteristics as a car barn, for its post-Earthquake period of construction, and as the work of master Michael M. O'Shaughnessy.	direction of the ERO			
Mitigation Measure M-CR-1d: Oral Histories (HRER Part II, Mitigation Measure 5)				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
The project sponsor team shall undertake an oral history project on the resource that may include interviews of people such as former SFMTA employees, or other community members who may offer informative historic perspectives on the history and significance of the resource. The project shall be conducted by a professional historian in conformance with the Oral History Association's Principles and Best Practices (https://www.oralhistory.org/principles-and-best-practices-revised-2018/). In addition to transcripts of the interviews, the oral history project shall include a narrative project summary report containing an introduction to the project, a methodology description, and brief summaries of each conducted interview. Copies of the completed oral history project shall be submitted to the San Francisco Public Library, Planning Department, and other interested historical institutions. The oral history project shall also be incorporated into the interpretative program.	Project Sponsor Team and qualified consultant, at the direction of the ERO	Prior to issuance of excavation permit or commencement of construction	Planning Department preservation staff shall review and approve the documentation package	Considered complete upon the Planning Department's approval and the Project Sponsor Team's implementation of the interpretive program plan
Mitigation Measure M-TCR-1: Tribal Cultural Resources Preservation and/or Interpretive Program				
During ground-disturbing activities that encounter archeological resources, if the Environmental Review Officer (ERO) determines that a significant archeological resource is present, and if in consultation with the affiliated Native American tribal representatives, the ERO determines that the resource constitutes a tribal cultural resource (TCR) and that the resource could be adversely affected by the proposed project, the proposed project shall be redesigned so as to avoid any adverse effect on the significant tribal cultural resource, if feasible. If the ERO, in consultation with the project sponsor, determines that preservation-in-place of the TCR would be both feasible and effective, then the archeological consultant shall prepare an archeological resource preservation plan (ARPP). Implementation of	Project Sponsor Team, construction contractors, and qualified consultant, at the direction of the ERO	Consultation and planning starting upon discovery of a potential TCR during archeological testing or during construction excavations; interpretive program to be implemented prior to issuance of building occupancy permit	Environmental Review Officer (ERO) or designee	In the event of the discovery of a TCR, considered complete after implementation of the Planning Department approved interpretation program

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
the approved ARPP by the archeological consultant shall be required when feasible. If the ERO, in consultation with the affiliated Native American tribal representatives and the project sponsor, determines that preservation-in-place of the TCR is not a sufficient or feasible option, then the project sponsor shall implement an interpretive program of the TCR in consultation with affiliated Native American tribal representatives. An interpretive plan produced in consultation with affiliated Native American tribal representatives, at a minimum, and approved by the ERO, would be required to guide the interpretive program. The plan shall identify proposed locations for installations or displays, the proposed content and materials of those displays or installation, the producers or artists of the displays or installation, and a long-term maintenance program. The interpretive program may include artist installations, preferably by local Native American artists, oral histories with local Native Americans, artifacts displays and interpretation, and educational panels or other informational displays.				
NOISE				
Mitigation Measure M-NO-1: Construction Noise Control				
The SFMTA and private project co-sponsor and/or its contractors on SFMTA's behalf (referred to below as project sponsor team) shall prepare construction noise control documentation as detailed below. Prior to issuance of any demolition or building permit, the project sponsor team shall submit a project-specific construction noise control plan to the Environmental Review Officer (ERO) or the ERO's designee for approval. The construction noise control plan shall be prepared by a qualified acoustical engineer, with input from the construction contractor, and include all feasible measures to reduce construction noise. The construction noise control plan shall identify noise control measures to meet a performance target of	Project Sponsor Team, construction contractors, acoustical engineer	Prior to the issuance of construction permits; prior to the commencement of each construction stage; implementation of monitoring ongoing during construction	Environmental review officer or designee in Planning Department, Project Sponsor Team	Noise control plan approved by ERO/Planning Department prior to construction and considered complete upon submission of a noise monitoring report after each construction phase and completion of construction activities

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
construction activities not resulting in a noise level greater than 90 dBA at noise-sensitive receptors and 10 dBA above the ambient noise level at noise-sensitive receptors. The project sponsor team shall ensure that requirements of the construction noise control plan are included in contract specifications. If nighttime construction is required, the plan shall include specific measures to reduce nighttime construction noise. The plan shall also include measures for notifying the public of construction activities, complaint procedures, and a plan for monitoring construction noise levels in the event complaints are received. The construction noise control plan shall include the following measures to the degree feasible, or other effective measures, to reduce construction noise levels: • Use construction equipment that is in good working order, and inspect mufflers for proper functionality; • Select "quiet" construction methods and equipment (e.g., improved mufflers, use of intake silencers, engine enclosures); • Use construction equipment with lower noise emission ratings whenever possible, particularly for air compressors; • Prohibit the idling of inactive construction equipment for more than five minutes; • Locate stationary noise sources (such as compressors) as far from nearby noise-sensitive receptors as possible (including future onsite noise-sensitive receptors at the Phase 2 Bryant Street Housing under the phased construction scenarios for the Refined Project), muffle such noise sources, and construct barriers around such sources and/or the construction site. • Avoid placing stationary noise-generating equipment (e.g., generators, compressors) within noise-sensitive buffer areas (as determined by the acoustical engineer) immediately adjacent to neighbors (including future onsite noise-				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
sensitive receptors at the Phase 2 Bryant Street Housing under the phased construction scenarios for the Refined Project). • Enclose or shield stationary noise sources from neighboring noise-sensitive properties (including the future onsite noise-sensitive receptors at the Phase 2 Bryant Street Housing under the phased construction scenarios for the Refined Project) with noise barriers to the extent feasible. To further reduce noise, locate stationary equipment in pit areas or excavated areas, if feasible; and • Install temporary barriers, barrier-backed sound curtains and/or acoustical panels around working powered impact equipment and, if necessary, around the perimeter of active construction areas or phases. When temporary barrier units are joined together, the mating surfaces shall be flush with each other. Gaps between barrier units, and between the bottom edge of the barrier panels and the ground, shall be closed with material that completely closes the gaps, and dense enough to attenuate noise. • Under the phased construction scenarios for the Refined Project, develop strategies to reduce exposure to construction noise in coordination with future onsite noise-sensitive receptors at the Phase 2 Bryant Street Housing. Some options to reduce noise include limiting noise to Phase 2 Bryant Street receptors by delaying or limiting occupancy in units closest to the construction zone or notifying receptors of loud construction periods. These options should be explored as part of the noise control plan prepared by a qualified noise consultant and the construction contractor. The construction noise control plan shall include the following measures for notifying the public of construction activities, complaint procedures, and monitoring construction noise levels:				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
• Designate an on-site construction noise manager for the project; • Notify neighboring noise-sensitive receptors within 300 feet of the project construction area at least 30 days in advance of high-intensity noise-generating activities (e.g., pier drilling, pile driving, and other activities that may generate noise levels greater than 90 dBA at noise-sensitive receptors) about the estimated duration of the activity (including future onsite noise-sensitive receptors at the Phase 2 Bryant Street Housing under the phased construction scenarios for the Refined Project); • Post a sign onsite describing noise complaint procedures and a complaint hotline number that shall always be answered during construction; • Implement a procedure for notifying the planning department of any noise complaints within one week of receiving a complaint; • Establish a list of measures for responding to and tracking complaints pertaining to construction noise. Such measures may include the evaluation and implementation of additional noise controls at sensitive receptors (residences, hospitals, convalescent homes, schools, churches, hotels and motels, and sensitive wildlife habitat); and • Conduct noise monitoring (measurements) at the beginning of major construction phases (e.g., demolition, grading, excavation) and during high-intensity construction activities to determine the effectiveness of noise attenuation measures and, if necessary, implement additional noise control measures. The construction noise control plan shall include the following additional measures in the event of pile-driving activities:				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
• When pile driving is to occur within 600 feet of a noise-sensitive receptor, implement "quiet" pile-driving technology (such as pre-drilling of piles, sonic pile drivers, auger cast-in-place, or drilled-displacement, or the use of more than one pile driver to shorten the total pile-driving duration [only if such measure is preferable to reduce impacts to sensitive receptors]) where feasible, in consideration of geotechnical and structural requirements and conditions; • Where the use of driven impact piles cannot be avoided, properly fit impact pile driving equipment with an intake and exhaust muffler and a sound-attenuating shroud, as specified by the manufacturer; and • Conduct noise monitoring (measurements) before, during, and after the pile-driving activity.				
Mitigation Measure M-NO-2: Vibration-Sensitive Equipment at 2601 Mariposa Street (KQED Building)				
Prior to construction, the SFMTA and private project co-sponsor and/or its contractors on SFMTA's behalf (referred to below as project sponsor team) shall designate and make available a community liaison to respond to vibration complaints from building occupants at the KQED building, located at 2601 Mariposa Street. Contact information for the community liaison shall be posted in a conspicuous location so that it is clearly visible to building occupants most likely to be disturbed. Through the community liaison, the project sponsor team shall provide notification to property owners and occupants of 2601 Mariposa Street at least 10 days prior to construction activities involving equipment that can generate vibration capable of interfering with vibration-sensitive equipment, informing them of the estimated start date and duration of vibration-generating construction activities. Equipment types capable of generating such vibration include an impact pile	Project Sponsor Team, and qualified consultant, at the direction of the ERO	Prior to the issuance building and construction permits	Project sponsor, project acoustical engineer and Planning Department	Considered complete after construction activities are completed and after buildings and/or structures are remediated to their pre-construction condition at the conclusion of vibration-generating activity on the site, should any damage occur

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
driver, or similar equipment, operating within 250 feet of the building or a vibratory roller, or similar equipment, operating within 125 feet of the building. If feasible, the project sponsor team shall identify potential alternative equipment and techniques that could reduce construction vibration levels. Alternative equipment and techniques may include, but are not limited to: • pre-drilled piles, • caisson drilling, • oscillating or rotating pile installation, • jetting piles into place using a water injection at the tip of the pile could be substituted for driven piles, if feasible, based on soil conditions, • static rollers could be substituted for vibratory rollers in some cases. If concerns prior to construction or complaints during construction related to equipment interference are identified, the community liaison shall work with the project sponsor team and the affected building occupants to resolve the concerns such that the vibration control measures would meet a performance target of the 65 VdB vibration level threshold for vibration sensitive equipment, as set forth by Federal Transit Authority (FTA). To resolve concerns raised by building occupants, the community liaison shall convey the details of the complaint(s) to the project sponsor team, such as who shall implement specific measures to ensure that the project construction meets the performance target of 65 VdB vibration level for vibration sensitive equipment. These measures may include evaluation by a qualified noise and vibration consultant, scheduling certain construction activities outside the hours of operation or recording periods of specific vibration-sensitive equipment if feasible, and/or conducting ground-borne vibration monitoring to document that the project can meet the performance target of 65 VdB at specific distances and/or locations. Ground-borne				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
vibration monitoring, if appropriate to resolve concerns, shall be conducted by a qualified noise and vibration consultant.				
Mitigation Measure NO-3: Fixed Mechanical Equipment Noise Control for Building Operations				
The SFMTA and a private project co-sponsor and/or its contractors on SFMTA's behalf (referred to below as project sponsor team) shall prepare operational noise control documentation as detailed below. Prior to approval of a building permit, the project sponsor team shall submit documentation to the Environmental Review Officer (ERO) or the officer's designee, demonstrating with reasonable certainty that the building's fixed mechanical equipment (such as heating, ventilation and air conditioning [HVAC] equipment) meets the noise limits specified in sections 2909 (b) and 2909 (d) of the noise ordinance (i.e., an 8-dB increase above the ambient noise level at the property plane for commercial or mixed-use properties; and interior noise limits of 55 dBA and 45 dBA for daytime and nighttime hours inside any sleeping or living room in a nearby dwelling unit on a residential property assuming windows open, respectively). Acoustical treatments required to meet the noise ordinance may include, but are not limited to: • Enclosing noise-generating mechanical equipment; • Installing relatively quiet models of air handlers, exhaust fans, and other mechanical equipment; • Using mufflers or silencers on equipment exhaust fans; • Orienting or shielding equipment to protect noise-sensitive receptors (residences, hospitals, convalescent homes, schools, churches, hotels and motels, and sensitive wildlife habitat) to the greatest extent feasible; • Increasing the distance between noise-generating equipment and noise-sensitive receptors; and/or	Project Sponsor Team and qualified consultant, at the direction of the ERO	Prior to the issuance building permit	Environmental Review Officer (ERO) or designee	Considered complete after receipt and acceptance of the appropriate documentation to the ERO

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
• Placing barriers around the equipment to facilitate the attenuation of noise. Compliance with this fixed-mechanical equipment noise control for building operations standard requirement does not obviate the need for the equipment to demonstrate compliance with the noise ordinance throughout the lifetime of the project.				
AIR QUALITY				
Mitigation Measure M-AQ-1: Off-Road Construction Equipment Emissions Minimization				
The SFMTA and private project co-sponsor and/or its contractors on SFMTA's behalf (referred to below as project sponsor team) shall comply with the following: A. Engine Requirements. 1. All off-road equipment greater than or equal to 25 horsepower shall have engines that meet U.S. EPA or California Air Resources Board Tier 4 Final off-road emission standards. 2. Where access to alternative sources of power is available, portable diesel engines shall be prohibited. If access to alternative sources of power is infeasible, portable diesel engines shall meet the requirements of Subsection (A)(1). 3. Diesel engines, whether for off-road or on-road equipment, shall not be left idling for more than two minutes, at any location, except as provided in exceptions to the applicable state regulations regarding idling for off-road and on-road equipment (e.g., traffic conditions, safe operating conditions). The project sponsor team shall post legible and visible signs in English, Spanish, and Chinese, in designated queuing	Project Sponsor Team, construction contractors	Prior to issuance of a construction permit; implementation ongoing during construction	Environmental Review Officer (ERO) or designee/ project sponsor	Considered complete upon Planning Department review and approval of Construction Emissions Minimization Plan, ongoing review and approval of biannual reports, and review and approval of final construction report

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
areas and at the construction site to remind operators of the two-minute idling limit. 4. The project sponsor team shall instruct construction workers and equipment operators on the maintenance and tuning of construction equipment and require that such workers and operators properly maintain and tune equipment in accordance with manufacturer specifications. B. Waivers. 1. The San Francisco Planning Department Environmental Review Officer (ERO) may waive the equipment requirements of Subsection (A)(1) if: a particular piece of off-road Tier 4 Final equipment is not regionally available, not technically feasible, or would not produce desired emissions reduction due to expected operating modes. In granting the waiver, the project sponsor team must demonstrate with substantial evidence that the project construction does not exceed the BAAQMD threshold for NOx (54 lbs/day) by resulting in a net increase of average daily NOx emissions greater than 4 pounds per day. The project sponsor team must also demonstrate with substantial evidence that the overall combined construction and operational excess cancer risk does not exceed 7 per 1 million persons exposed at nearby sensitive receptors. C. Construction Emissions Minimization Plan. 1. Before starting onsite construction activities, the project sponsor team shall submit a Construction Emissions Minimization Plan (Plan) to the ERO for review and approval. The Plan shall state, in reasonable detail, how the project sponsor team will meet the requirements of Section A.				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
2. The Plan shall include estimates of the construction timeline by phase, with a description of each piece of off-road equipment required for every construction phase. The description may include, but is not limited to: equipment type, equipment manufacturer, equipment identification number, engine model year, engine certification (Tier rating), horsepower, engine serial number, and expected fuel use and hours of operation. 3. The project sponsor team shall ensure that all applicable requirements of the Plan have been incorporated into the contract specifications. The Plan shall include a certification statement that the project sponsor team agrees to comply fully with the Plan. 4. The project sponsor team shall make the Plan available to the public for review onsite during working hours. The project sponsor team shall post at the construction site a legible and visible sign summarizing the Plan. The sign shall also state that the public may ask to inspect the Plan for the project at any time during working hours and shall explain how to request to inspect the Plan. The project sponsor team shall post at least one copy of the sign in a visible location on each side of the construction site facing a public right-of-way. D. Monitoring 1. After start of construction activities, the project sponsor team shall submit biannual reports to the ERO documenting compliance with the Plan. After completion of construction activities and prior to receiving a final certificate of occupancy, the project sponsor team shall submit to the ERO a final report summarizing construction activities, including the start and end dates and duration of each construction phase, and the specific information required in the Plan.				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
Mitigation Measure M-AQ-3: Emergency Diesel Generator Health Risk Reduction Plan				
The SFMTA and private project co-sponsor and/or its contractors on SFMTA's behalf (referred to below as the project sponsor team) shall comply with the following: 1. Require all emergency diesel generators to meet Tier 4 Final emission standards and reduce annual testing limit to 20 hours per year for each generator; or 2. Require all emergency generators to be battery-powered; or 3. The project sponsor team shall retain a qualified air quality consultant to develop an Emergency Diesel Generator Health Risk Reduction Plan. The project sponsor team shall submit the plan to the San Francisco Planning Department Environmental Review Officer (ERO) for review and approval prior to issuance of a permit for emergency diesel generators from the San Francisco Department of Building Inspection or the Bay Area Air Quality Management District. The plan must include, for each emergency diesel generator, a description of the anticipated venting location, engine specifications, and annual maintenance testing procedures. The plan must demonstrate with substantial evidence that annual maintenance testing will not result in the project's overall construction and operational cancer risk exceeding 7 per one million persons exposed at nearby offsite sensitive receptors. Additionally, the operator of the facility at which the generators are located (including the private project co-sponsor as applicable) shall be required to maintain records of the testing schedule for each emergency diesel generator for the life of that generator and to	Project Sponsor Team and construction contractor	Prior to issuance of a permit for emergency diesel generator	Project Sponsor Team, facility maintenance contractor, and the Planning Department	Considered complete upon Planning Department review and approval of Emergency Diesel Generator Health Risk Reduction Plan

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
provide this information for review to the planning department within three months of requesting such information.				
WIND				
Mitigation Measure M-WI-1(a): Design Measures to Reduce Project-Specific Wind Impacts				
The project sponsor team shall retain a qualified wind consultant to prepare, in consultation with the San Francisco Planning Department (planning department), a wind impact mitigation report that identifies design measures to reduce the project's wind impacts in the project scenario. Prior to certification of the Final Environmental Impact Report, the project sponsor team shall submit the wind impact mitigation report to the planning department for its final review and approval. The wind impact mitigation report shall incorporate updated information on the building design based on a list of potential wind reduction measures identified below, along with the estimated effectiveness of each measure to reduce the identified off-site wind hazards. • Porous façades on portions of the north, east and west sides for natural ventilation as part of the heating, ventilation, and air conditioning strategy for the new transit facility at the second and third levels • Recessed building corner up to 12 feet in height at the southwest corner of proposed building near Bryant/Mariposa intersection • Vertical elevated screens on portions of the second and third levels of the west façade (Bryant Street) • Vertical wind screens at grade level on the adjacent Bryant Street sidewalk near the Bryant/Mariposa intersection Such wind reduction design measures may include additional on-site landscaping, or equivalent wind-reducing features; and off-site wind reduction measures such as landscaping, streetscape	Project Sponsor Team/qualified consultant	Prior to completion of the environmental review	Project Sponsor Team, and the Planning Department	Completion of and acceptance of the wind impact mitigation report by the Planning Department

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
improvements or other wind-reducing features, such as wind screens. The project sponsor team shall implement as many of the design measures identified in the wind impact mitigation report as needed to reduce the proposed project's or project variants' potential to create a new wind hazard or exacerbate an existing wind hazard in publicly accessible areas of substantial pedestrian use to less-than-significant levels. The final wind impact mitigation report should not find that the project produces a net increase of the already identified wind hazard exceedances. The planning department shall approve the final list of wind reduction measures that the project sponsor team shall implement.				
Mitigation Measure M-WI-1(b): Additional Wind Testing				
If changes to the building design or massing are proposed after certification of the Final Environmental Impact Report, additional wind analysis may be required to confirm the modified design does not result in any 9-hour wind hazard exceedances and to minimize 1-hour wind hazard exceedances. If the planning department determines that the modified design could result in wind hazard criterion exceedances (for example, due to the removal of one or more wind reducing features), the project sponsor team shall retain a qualified wind consultant to prepare a wind analysis under the direction of the planning department. The wind analysis may require a wind tunnel test and shall identify wind reduction measures needed to avoid 9-hour wind hazard exceedances and to minimize 1-hour wind hazard exceedances.	Project Sponsor Team /qualified consultant	Prior to completion of the environmental review	Project Sponsor Team, and the Planning Department	Completion of and acceptance of the wind impact mitigation report by the Planning Department
GEOLOGY AND SOILS				
Mitigation Measure M-GE-6a: Inadvertent Discovery of Paleontological Resources				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
Worker Awareness Training - Prior to commencing construction, and ongoing throughout ground disturbing activities (e.g., excavation, utility installation, the project sponsor and/or their designee shall ensure that all project construction workers are trained on the contents of the Paleontological Resources Alert Sheet, as provided by the Planning Department. The Paleontological Resources Alert Sheet shall be prominently displayed at the construction site during ground disturbing activities for reference regarding potential paleontological resources. In addition, the project sponsor shall inform the contractor and construction personnel of the immediate stop work procedures and other procedures to be followed if bones or other potential fossils are unearthed at the project site. Should new workers that will be involved in ground disturbing construction activities begin employment after the initial training has occurred, the construction supervisor shall ensure that they receive the worker awareness training as described above. The project sponsor shall complete the standard form/affidavit confirming the timing of the worker awareness training to the Environmental Review Officer (ERO). The affidavit shall confirm the project's location, the date of training, the location of the informational handout display, and the number of participants. The affidavit shall be transmitted to the ERO within five (5) business days of conducting the training. Paleontological Resource Discoveries - In the event of the discovery of an unanticipated paleontological resource during project construction, ground disturbing activities shall temporarily be halted within 25 feet of the find until the discovery is examined by a qualified paleontologist as recommended by the Society of	Project Sponsor Team, construction contractors, at the direction of the ERO	Prior to construction commencement	Project Sponsor Team and the Planning Department	Submission of evidence of worker awareness training and distribution of alert sheet to the satisfaction of the Planning Department, including proper adherence to procedures if a resource is encountered

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
Vertebrate Paleontology standards (SVP 2010) and Best Practices in Mitigation Paleontology (Murphey et al. 2019). Work within the sensitive area shall resume only when deemed appropriate by the qualified paleontologist in consultation with the ERO. The qualified paleontologist shall determine: 1) if the discovery is scientifically significant; 2) the necessity for involving other responsible or resource agencies and stakeholders, if required or determined applicable; and 3) methods for resource recovery. If a paleontological resource assessment results in a determination that the resource is not scientifically important, this conclusion shall be documented in a Paleontological Evaluation Letter to demonstrate compliance with applicable statutory requirements (e.g., Federal Antiquities Act of 1906, CEQA Guidelines Section 15064.5, California Public Resources Code Chapter 17, Section 5097.5, Paleontological Resources Preservation Act 2009). The Paleontological Evaluation Letter shall be submitted to the ERO for review within 30 days of the discovery. If the qualified paleontologist determines that a paleontological resource is of scientific importance, and there are no feasible measures to avoid disturbing this paleontological resource, the qualified paleontologist shall prepare a Paleontological Mitigation Program. The mitigation program shall include measures to fully document and recover the resource of scientific importance. The qualified paleontologist shall submit the mitigation program to the ERO for review and approval within 10 business days of the discovery. Upon approval by the ERO, ground disturbing activities in the project area shall resume and be monitored as determined by the qualified paleontologist for the duration of such activities. The mitigation program shall include: 1) procedures for construction monitoring at the project site; 2) fossil preparation and				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
identification procedures; 3) curation of paleontological resources of scientific importance into an appropriate repository; and 4) preparation of a Paleontological Resources Report (report or paleontology report) at the conclusion of ground disturbing activities. The report shall include dates of field work, results of monitoring, fossil identifications to the lowest possible taxonomic level, analysis of the fossil collection, a discussion of the scientific significance of the fossil collection, conclusions, locality forms, an itemized list of specimens, and a repository receipt from the curation facility. The project sponsor shall be responsible for the preparation and implementation of the mitigation program, in addition to any costs necessary to prepare and identify collected fossils, and for any curation fees charged by the paleontological repository. The paleontology report shall be submitted to the ERO for review within 30 business days from conclusion of ground disturbing activities, or as negotiated following consultation with the ERO.				
Mitigation Measure M-GE-6b: Preconstruction Paleontological Evaluation and Monitoring Plan during Construction				
The project sponsor shall engage a qualified paleontologist to develop a site-specific monitoring plan prior to commencing soil-disturbing activities at the project site. The Preconstruction Paleontological Monitoring Plan would determine project construction activities requiring paleontological monitoring based on those may affect sediments with moderate sensitivity for paleontological resources. Prior to issuance of any demolition permit, the project sponsor shall submit the Preconstruction Paleontological Monitoring Plan to the ERO for approval. At a minimum, the plan shall include: 1. Project Description 2. Regulatory Environment – outline applicable federal, state and local regulations	Project Sponsor Team, construction contractors, and qualified consultant, at the direction of the ERO	Prior to construction commencement	Project Sponsor Team and the Planning Department	Completion of and acceptance of the Preconstruction Paleontological Evaluation by the Planning Department

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
3. Summary of Sensitivity Classification(s) 4. Research Methods, including but not limited to: 4.a. Field studies conducted by the approved paleontologist to check for fossils at the surface and assess the exposed sediments. 4.b. Literature Review to include an examination of geologic maps and a review of relevant geological and paleontological literature to determine the nature of geologic units in the project area. 4.c. Locality Search to include outreach to the University of California Museum of Paleontology in Berkeley. 5. Results: to include a summary of literature review and finding of potential site sensitivity for paleontological resources; and depth of potential resources if known. 6. Recommendations for any additional measures that could be necessary to avoid or reduce any adverse impacts to recorded and/or inadvertently discovered paleontological resources of scientific importance. Such measures could include: 6.a. Avoidance: If a known fossil locality appears to contain critical scientific information that should be left undisturbed for subsequent scientific evaluation. 6.b. Fossil Recovery: If isolated small, medium- or large-sized fossils are discovered during field surveys or construction monitoring, and they are determined to be scientifically significant, they should be recovered. Fossil recovery may involve collecting a fully exposed fossil from the ground surface, or may involve a systematic excavation, depending upon the size and complexity of the fossil discovery. 6.c. Monitoring: Monitoring involves systematic inspections of graded cut slopes, trench sidewalls, spoils piles, and other types of construction				

MONITORING AND REPORTING PROGRAM[1]

Adopted Mitigation Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
excavations for the presence of fossils, and the fossil recovery and documentation of these fossils before they are destroyed by further ground disturbing actions. Standard monitoring is typically used in the most paleontologically sensitive geographic areas/geologic units (moderate, high and very high potential); while spot-check monitoring is typically used in geographic areas/geologic units of moderate or unknown paleontological sensitivity (moderate or unknown potential). 6.d. Data recovery and reporting: Fossil and associated data discovered during soils disturbing activities should be treated according to professional paleontological standards and documented in a data recovery report. The plan should define the scope of the data recovery report. The consultant shall document the monitoring conducted according to the monitoring plan and any data recovery completed for significant paleontological resource finds discovered, if any. Plans and reports prepared by the consultant shall be considered draft reports subject to revision until final approval by the ERO. The final monitoring report and any data recovery report shall be submitted to the ERO prior to the certificate of occupancy.				

Continues on the next page.

Table 5: IMPROVEMENT MEASURES FOR THE POTRERO YARD MODERNIZATION PROJECT

MONITORING AND REPORTING PROGRAM[1]

Adopted Improvement Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
IMPROVEMENT MEASURES AGREED TO BY PROJECT SPONSOR TEAM				
TRANSPORTATION				
Improvement Measure I-TR-A: Construction Management Plan – Additional Measures				
As part of the project's construction management plan, the SFMTA and a private project co-sponsor and/or its contractors on SFMTA's behalf (referred to as project sponsor team) will require additional measures to further minimize disruptions to people walking and bicycling, transit, and emergency vehicles during project construction: The additional measures include: Carpool, Bicycle, Walk, and Transit Access for Construction Workers—Carpool, Bicycle, Walk, and Transit Access for Construction Workers—To minimize parking demand and vehicle trips associated with construction workers, the construction contractor will include as part of the Construction Management Plan methods to encourage carpooling, bicycle, walk, and transit access to the project site by construction workers. These methods could include providing secure bicycle parking spaces, participating in free-to-employee and employer ride matching program from www.511.org, participating in emergency ride home program through the City of San Francisco (www.sferh.org), and providing transit information to construction workers. Project Construction Updates for Adjacent Businesses and Residents— To minimize construction impacts on access to nearby residences and businesses, the project sponsor team will provide nearby residences and adjacent businesses with regularly updated information regarding project construction, including construction activities, peak construction vehicle activities, travel lane closures,	Project Sponsor Team, including SFMTA regulatory teams, and construction contractor	Prior to the issuance of construction permits; implementation ongoing during construction with construction updates provided weekly; Active Monitoring of Detours as needed	Project Sponsor Team, SFMTA (in its regulatory capacity)	Considered complete upon the submittal and approval of the Construction Management Plan to the SFMTA (in its regulatory capacity)

MONITORING AND REPORTING PROGRAM[1]

Adopted Improvement Measures	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
and parking lane and sidewalk closures (e.g., via the project's website). At regular intervals to be defined in the construction management plan, a regular email notice will be distributed by the project sponsor team that would provide current construction information of interest to neighbors, as well as contact information for specific construction inquiries or concerns.				
Improvement Measure I-TR-B: Driveway and Loading Operations Plan (DLOP)				
The project sponsor team (including joint development project sponsor as applicable) will be required to prepare and implement a Driveway and Loading Operations Plan (DLOP). The DLOP will be prepared by the private project co-sponsor, in coordination with the SFMTA, and submitted as part of the application for the first temporary occupancy permit. The DLOP will include provisions to manage loading activities and driveway operations associated with the below-grade onsite loading spaces; provisions for assessing on-street commercial and passenger loading supply and protocol for expanding on-street supply, if needed; provisions for trash/recycling/compost truck access and collection operations; provisions for residential move-in and move-out operations; provisions for scheduling Muni deliveries using the onsite loading facilities; and provisions for accommodating recurring deliveries such as UPS, Federal Express, and USPS within the onsite loading facilities. The intent of the DLOP is to reduce potential conflicts between passenger and freight loading and transit operations, and between passenger and freight loading activities and people walking and bicycling, and other vehicles in the project vicinity, as well as to maximize reliance on onsite facilities to accommodate freight loading demand.	Project Sponsor Team	Project Sponsor Team to submit Loading Management Plan to ERO prior to the issuance of any certificate of occupancy for the proposed project.	ERO, Project Sponsor Team or successor owner/ manager of residential building	Considered complete upon ERO approval of Loading Management Plan; Ongoing monitoring to continue indefinitely

Table 6: PUBLIC WORKS STANDARD CONSTRUCTION MEASURES FOR THE POTRERO YARD MODERNIZATION PROJECT

Public Works' Regulatory Affairs division will ensure the Standard Construction Measures are included in construction specifications and contracts. The planning department environmental monitoring team will confirm the public works standard construction measures have been incorporated into the final project agreement with the project sponsor team.

	MONITORING AND REPORTING PROGRAM[1]			
Adopted Public Works Standard Construction Measure	**Implementation Responsibility**	**Mitigation Schedule**	**Monitoring / Reporting Responsibility**	**Monitoring Actions / Completion Criteria**
PUBLIC WORKS STANDARD CONSTRUCTION MEASURES AGREED TO BY PROJECT SPONSOR TEAM				
Public Works Standard Construction Measure #1, Seismic and Geotechnical Studies (Geology and Soils)				
The project manager shall ensure that projects that may potentially be affected by existing soil, slope and/or geologic conditions at the project site will be screened for liquefaction, subsidence, landslide, fault displacement, and other geological hazards at the project site, and will be engineered and designed as necessary to minimize risks to safety and reliability due to such hazards. As necessary, geotechnical investigations will be performed.	Project Sponsor Team, construction contractors	Prior to construction	Project Sponsor Team, Planning Department, Public Works Regulatory Affairs	Considered complete upon submission of geotechnical investigations, if applicable
Public Works Standard Construction Measure #2, Air Quality				
All projects will comply with the Construction Dust Control Ordinance. Major construction projects that are estimated to require 20 or more days of cumulative work within the Air Pollutant Exposure Zone must comply with the additional clean construction requirements of the Clean Construction Ordinance.	Project Sponsor Team, construction contractors	Ongoing during construction	Project Sponsor Team, Planning Department, Public Works Regulatory Affairs	Considered complete upon submission of a Site-Specific Dust Control Plan for the review and approval of the Department of Public Health
Public Works Standard Construction Measure #3, Water Quality				
All projects will implement erosion and sedimentation controls to be tailored to the project site, such as fiber rolls and/or gravel bags around storm drain inlets, installation of silt fences, and other such measures sufficient-to prevent discharges of sediment and other pollutants to storm drains and all surface waterways, such as San Francisco Bay, the Pacific Ocean, water supply reservoirs, wetlands, swales, and streams. As required based on project location and size,	Project Sponsor Team, construction contractors	Ongoing during construction	Project Sponsor Team, Planning Department, Public Works Regulatory Affairs	Considered complete upon Project Sponsor Team's enforcement of water quality considerations

MONITORING AND REPORTING PROGRAM[1]

Adopted Public Works Standard Construction Measure	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
a Stormwater Control Plan (in most areas of San Francisco) or a Stormwater Pollution Prevention Plan (SWPPP) (in certain areas of San Francisco) will be prepared. If uncontaminated groundwater is encountered during excavation activities, it will be discharged in compliance with applicable water quality standards and discharge permit requirements.				
Public Works Standard Construction Measure #4, Traffic				
All projects will implement traffic control measures sufficient to maintain traffic and pedestrian circulation on streets affected by construction of the project. The measures will also, at a minimum, be consistent with the requirements of San Francisco Municipal Transportation Agency (SFMTA)'s Blue Book. Traffic control measures may include, but not be limited to, flaggers and/or construction warning sign age of work ahead; scheduling truck trips during non-peak hours to the extent feasible; maintaining access to driveways, private roads, and off-street commercial loading facilities by using steel trench plates or other such method; and coordination with local emergency responders to maintain emergency access. Any temporary rerouting of transit vehicles or relocation of transit facilities would be coordinated with SFMTA Muni Operations.	Project Sponsor Team, construction contractors	Ongoing during construction	Project Sponsor Team; SFMTA Muni Operations, Public Works Regulatory Affairs	Considered complete upon the submittal and approval of the Construction Management Plan to the SFMTA
Public Works Standard Construction Measure #5, Noise				
All projects will comply with local noise ordinances resulting construction noise. Public Works shall undertake measures to minimize noise disruption to nearby neighbors and sensitive receptors during construction. These efforts could include using best available noise control technologies on equipment (i.e., mufflers, ducts, and acoustically attenuating shields), locating stationary noise sources (i.e., pumps and generators) away from sensitive receptors, erecting temporary noise barriers, and other such means.	Project Sponsor Team, construction contractors	Ongoing during construction	Project Sponsor Team, Planning Department, Public Works Regulatory Affairs	Considered complete upon Project Sponsor enforcement of local noise ordinances

MONITORING AND REPORTING PROGRAM[1]

Adopted Public Works Standard Construction Measure	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
Public Works Standard Construction Measure #6, Hazardous Materials				
Projects that involve excavation of 50 cubic yards of soil in the Maher Zone will comply with the Maher Ordinance. Projects on sites that are not currently located in the Maher Zone but have the potential to contain hazardous materials in soil and/or groundwater will be referred to the Department of Public Health as newly identified Maher sites.	Project Sponsor Team, construction contractors	Ongoing during construction	Project Sponsor Team, Planning Department, Public Works Regulatory Affairs	Considered complete upon Project Sponsor enforcement of Maher ordinance
Public Works Standard Construction Measure #7, Biological Resources				
Projects will comply with all local, state, and federal requirements for surveys, analysis, and protection of biological resources (e.g., Migratory Bird Treaty Act, Federal and State Endangered Species Acts, etc.). The project site and the immediately surrounding area will be screened to determine whether biological resources may be affected by construction. If biological resources are present, a qualified biologist will carry out a survey of the project site to note the presence of general biological resources and to identify whether habitat for special-status species and/or migratory birds is present. If necessary, measures will be implemented to protect biological resources, such as installing wildlife exclusion fencing, establishing work buffer zones, installing bird deterrents, having a qualified biologist conduct monitoring, and other such applicable measures. Tree removal will also comply with any applicable tree protection ordinance.	Project Sponsor Team, construction contractors	Ongoing during construction	Project Sponsor Team, Planning Department, Public Works Regulatory Affairs	Considered complete upon Project Sponsor enforcement of biological considerations
Public Works Standard Construction Measure #8, Visual and Aesthetic Considerations, Project Site				
All project sites will be maintained in a clean and orderly state. Construction staging areas will be sited away from public view, and on currently paved or previously disturbed areas, where possible.	Project Sponsor Team, construction contractors	Ongoing during construction	Project Sponsor Team, Planning Department, Public Works Regulatory Affairs	Considered complete upon Project Sponsor Team's enforcement of visual considerations

MONITORING AND REPORTING PROGRAM[1]

Adopted Public Works Standard Construction Measure	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
Nighttime lighting will be directed away from residential areas and have shields to prevent light spillover effects. Upon project completion, project sites on City-owned lands will be returned to their general pre-project condition, including re-grading of the site and re-vegetation or re-paving of disturbed areas to the extent this is consistent with Public Works Bureau of Urban Forestry Policy and San Francisco Code. Project sites on non-City land will be restored to their general pre-project condition so that the owner may return them to their prior use, unless otherwise arranged with the property owner.				
Public Works Standard Construction Measure #9, Cultural Resources				
All projects that will alter a building or structure, produce vibrations, or include soil disturbance will be screened to assess whether cultural resources are or may be present and could be affected, as detailed below. Soil is defined as native earthen deposits or introduced earthen fill. Soil does not include materials that were previously introduced as part of roadway pavement section including asphalt concrete wearing roadway base and subbase. *Archeological Resources.* The EP Archeologist has determined that Standard Archeological Measure III (Testing/Data Recovery) shall be implemented by Public Works to protect and/or treat significant archeological resources identified as being present within the site and potentially affected by the project (see Attachment H: Public Works Archeological Measure III (Testing / Data Recovery)). 1. Public Works shall implement the EP Archeologist's recommendations prior to and/or during project construction consistent with Standard Archeological Measure III and shall consult with the EP Archeologist in	Project Sponsor Team, construction contractors	Prior to issuance of a construction permit	Project Sponsor Team, the EP Archeologist staff, Public Works and the ERO	Considered complete upon compliance with Standard Archeological Measure III (Testing/Data Recovery) requirements

Adopted Public Works Standard Construction Measure	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
selecting a qualified archeological consultant from the EP Archeological Resources Consultant Pool, as needed, to implement these measures. 2. Soil-disturbing activities in archeologically sensitive areas, as identified through the above process, will not begin until preconstruction archeological measures required by the EP Archeologist (e.g., preparation of an Archeological Testing Plan, Archeological Treatment Plan, and/or an Archeological Data Recovery Plan) have been implemented.				
Public Works Standard Construction Measure #9, Cultural Resources				
All projects that will alter a building or structure, produce vibrations, or include soil will be screened to assess whether cultural resources are or may be present disturbance and could be affected, as detailed below. *Historic (Built Environment) Resources*. Where construction will take place in proximity to a building or structure identified as a significant historical resource but would not otherwise directly affect it, Public Works will implement protective measures, such as but not limited to, the erection of temporary construction barriers to ensure that inadvertent impacts to such buildings or structures are avoided. These measures shall require the development of a Construction Best Practices for Historical Resources Plan and a plan outlining the Construction Monitoring for Historical Resources Program to be reviewed and approved by CCSF Planning Department Preservation staff. If a project includes or is directly adjacent to historic buildings or structures susceptible to vibration (such as but not limited to unreinforced masonry, earthen construction, lathe and plaster, or fragile architectural ornamentation) as determined in consultation with CCSF Planning Department Preservation staff, Public Works will determine if vibrations associated with proposed construction	Project Sponsor Team, construction contractors	Prior to issuance of a construction permit	Project Sponsor Team, the EP Preservation staff, Public Works and the ERO	Considered complete upon compliance with requirements

MONITORING AND REPORTING PROGRAM[1]

Adopted Public Works Standard Construction Measure	Implementation Responsibility	Mitigation Schedule	Monitoring / Reporting Responsibility	Monitoring Actions / Completion Criteria
activities has the potential to cause damage to such buildings or structures. Generally, vibration below 0.12 inches per second peak particle velocity does not have the potential to damage sensitive buildings or structures. A vibration study may be necessary to determine if such vibration levels will occur. If Public Works determines in consultation with CCSF Planning Department Preservation staff that vibration damage may occur, Public Works will engage a qualified historic architect or historic preservation professional to document and photograph the preconstruction condition of the building and prepare a plan for monitoring the building during construction. The monitoring plan will be submitted to and approved by CCSF Planning Department Preservation Planner prior to the beginning of construction and will be implemented during construction. The monitoring plan will identify how often monitoring will occur, who will undertake the monitoring, reporting requirements on vibration levels, reporting requirements on damage to adjacent historical resources during construction, reporting procedures to follow if such damage occurs, and the scope of the preconstruction survey and post-construction conditions assessment. If any damage to a historic building or structure occurs, Public Works will modify activities to minimize further vibration. If any damage occurs, the building will be repaired following the Secretary of the Interior's Standards for the Treatment of Historic Properties under the guidance of a qualified historic architect or historic preservation professional in consultation with CCSF Department Preservation Planner.				

[1] *Definitions of MMRP Column Headings:*
Adopted Mitigation, Improvement or Public Works Standard Construction Measures: Full text of the mitigation measures, improvement measures or Public Works Standard Construction Measures copied verbatim from the final CEQA document.
Implementation Responsibility: Entity who is responsible for implementing the mitigation measures, improvement measures or Public Works Standard Construction Measures. In most cases this is the project sponsor and/or project's sponsor's contractor/consultant and at times under the direction of the planning department.
Mitigation Schedule: Identifies milestones for when the actions in the mitigation measure, improvement measure or Public Works Standard Construction Measure need to be implemented.

Monitoring/Reporting Responsibility: Identifies who is responsible for monitoring compliance with the mitigation measure, improvement measure or Public Works Standard Construction Measure and any reporting responsibilities. In most cases it is the Planning Department who is responsible for monitoring compliance. If a department or agency other than the planning department is identified as responsible for monitoring, there should be an expressed agreement between the planning department and that other department/agency. In most cases the project sponsor, their contractor, or consultant are responsible for any reporting requirements.
Monitoring Actions/Completion Criteria: Identifies the milestone at which the mitigation measure, improvement measure or Public Works Standard Construction Measure is considered complete. This may also identify requirements for verifying compliance.

SECTION 01 35 44 - HAZARDOUS BUILDING MATERIALS SCOPE OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Principal Project Company shall perform Hazardous Materials abatement, removal, and remediation before any demolition Work and for any disturbance of areas on the Project Site that contain Hazardous Materials.

B. This Section 01 35 44 includes the scope of work for abatement and/or removal of Hazardous Materials, including Hazardous Waste and contaminated materials, environmental training requirements, minimum qualifications to perform Work related to Hazardous Materials, applicable Laws, Project requirements, and handling procedures required as part of the D&C Work.

C. Many of the materials and items of equipment used to construct the improvements and facilities at the Project Site contain substances recognized by the State of California as being carcinogenic or reproductive toxins. Such hazardous, contaminated, and non-Hazardous Materials include, and are not limited to, Hazardous Materials, non-Hazardous Materials, soils, heavy metals, asbestos; serpentine rock (which may contain natural asbestos); soils with naturally-occurring asbestos; lead-containing paints and coatings; lead sheeting; mercury; debris, mold and fungi; bacterial/biological contamination. Materials that may be encountered include polychlorinated biphenyl (PCB) ballasts, mercury containing lamps; asbestos; lead and other Hazardous Materials.

D. No environmental or Hazardous Materials sampling or analysis shall be conducted without written permission from the SAR group within City Public Works Department. This does not include Principal Project Company's obligation for any personnel air monitoring of its employees.

E. ENVIRONMENTAL TRAINING REQUIREMENTS: Principal Project Company shall ensure all workers on the Project Site, including DB Contractors' workers. complete the environmental trainings listed below. Principal Project Company shall ensure that such workers have all necessary training certifications, and personal protective equipment (PPE) as required by applicable Law. Principal Project Company shall submit to The SAR group within City Public Works Department certifications or proof of the trainings, listed below, as a Submittal as per Section 02 80 13 Hazardous Building Materials Remediation.

1. Health and Safety training

2. HAZWOPER training

3. Cal/OSHA Competent Person training for the field supervisor overseeing activities that disturb asbestos, or naturally occurring asbestos (NOA) as per Title 8 CCR 1529.

4. Cal/OSHA asbestos training (for all trades who will come in contact and disturb asbestos or NOA.

5. Lead training (for all trades that will come in contact and disturb lead containing paints as per Cal/OSHA 1532.1 Lead in Construction standard)

6. Medical examination and blood tests (as warranted)

7. Respiratory protection (including current respirator fit test records)

8. Storm water pollution prevention awareness training to enable the Principal Project Company's personnel to comply with the Erosion and Sediment Control Plan.

9. Other training pertaining to the Work being conducted.

1.2 RELATED DOCUMENTS AND SECTIONS

A. Section 02 80 13 Hazardous Building Materials Remediation

1.3 SCOPE OF WORK – HAZARDOUS BUILDING MATERIALS

A. Principal Project Company is hereby notified that Hazardous Materials, including Hazardous Waste and contaminated materials, are present on the Project Site. Principal Project Company shall perform a survey of all Hazardous Materials on the Project Site.

B. Principal Project Company shall verify existing conditions and quantities of Hazardous Materials and shall comply with all applicable Laws when handling these materials.

C. Principal Project Company shall ensure that all abatement, removal, and remediation of Hazardous Materials is performed by a licensed abatement contractor under proper Cal-OSHA work procedures. The waste stream generated by abatement Work shall be classified, handled, containerized, labeled, manifested, transported, and disposed in compliance with applicable Laws.

D. In performing the Work, Principal Project Company shall verify if the Work will involve the disturbance, removal, abatement, remediation, clean up, transportation and disposal of Hazardous Materials. Principal Project Company is responsible for the removal, abatement, remediation, clean up, transportation, and disposal of any such environmentally-regulated Hazardous Materials.

E. Principal Project Company is responsible for verifying existing site conditions and quantities of Hazardous Materials. Principal Project Company shall comply with applicable Laws when handling these materials.

F. Lead-Related Removal: lead-containing and lead-based paint are present throughout the Project Site in buildings and on interior and exterior finishes. Principal Project Company shall ensure that all painted surfaces affected by the Work are removed in accordance with Cal/OSHA 1532.1 Lead in Construction standard. The lead-related D&C Work shall be coordinated with all demolition work.

G. The City has not verified that any paints, coatings, dusts, or other materials are not lead containing, therefore Principal Project Company shall ensure that all "trigger 1" construction activities, such as demolition of painted surfaces, manual scraping or sanding of painted surfaces, or renovations impacting painted surfaces and primed structural steel are completed using dust controls and personal protective measures in compliance with the Cal/OSHA Construction Lead Standard, 8 CCR 1532.1. All settled dust within ductwork, ceiling plenums, crawl spaces, attics, chases and non-regular housekeeping areas shall be treated as having measurable lead content requiring compliance with Cal OSHA 1532.1.

H. Other Regulated Materials: Principal Project Company shall remove or recycle the following materials:

1. PCB-containing Light Ballasts: Fluorescent fixtures and high intensity discharge lamps shall be treated as having a mix of PCB and non-PCB ballasts, requiring disposal of impacted suspect units as Hazardous Waste.

2. PCB-containing building materials.

3. Mercury, Cadmium, and/or Sodium-Containing Fluorescent Light Tubes/Bulbs: Fluorescent and mercury vapor lamps on the Project Site shall be treated as having mercury content requiring removal and recycling of quantities greater than 25 fixtures per day impacted by the Project's demolition or renovation activities.

4. Mercury-containing Materials: All mercury-containing thermometers, thermostats, and all mercoid switches shall be treated as mercury-containing, requiring removal, disposal as Hazardous Waste .

5. Tritium Exit Signs/emergency lighting: Principal Project Company shall ensure that tritium exit signs/emergency lighting are properly recycled or disposed per Federal and State Law.

6. Sewage, Sludge, and Bacterial Hazards Associated from Untreated Sewage: Principal Project Company shall ensure that pigeon wastes and leaking sewage lines are treated as a biohazard and Principal Project Company shall comply with Cal/OSHA blood borne pathogen safety requirements.

7. Mold: Surfaces affected by mold growth shall be removed or treated as recommended in guidance documents, such as "Guidelines on Assessment and Remediation of Fungi in Indoor Environments" (New York City Department of Health, April 2000), guidelines established in Bio aerosols Assessment and Control (J. Macher, Editor, ACGIH, 1999) and "Mold Remediation in Schools and Commercial Buildings" (U.S. Environmental Protection Agency, March 2001) and as otherwise noted in the Contract Documents.

8. Lead Sheeting:

9. Arsenic: Principal Project Company shall assume the following conditions exist on the Project Site:

    a. Treated timbers:

        1) Contain up to 3.9% of arsenic;

        2) Have a surface density measured at about 2,000 microgram/cm2 of arsenic;

        3) Show 4 - 25 microgram/cm2 loose arsenic based on wipe samples.

        4) Are considered Hazardous Waste.

1.4 ABATEMENT CONTRACTOR'S QUALIFICATIONS

A. Principal Project Company may perform abatement Work itself, if it possesses the necessary qualifications and licenses, or it may subcontract the abatement Work. In either case, Principal Project Company shall ensure that any entity that performs the abatement Work:

1. Submits to the SAR group within City Public Works Department current licenses and certifications for the specific type of abatement Work to be performed. Submits to the SAR group within City Public Works Department a letter confirming compliance with current Laws, as outlined in the specifications listed in the paragraph below.

2. Submits to SAR group within City Public Works Department copies of any notices regarding safety and environmental violations received from regulatory agencies in the last 20 years.

3. Meets the following minimum qualifications

a. Is a legally recognized entity capable of entering into contracts and holding a valid license in good standing with the State of California and the City and County of San Francisco. Complies with all City contracting requirements and possesses the necessary qualifications to conduct business in San Francisco.

b. Holds a valid **Class B**, General Building Contractor's license issued by the Contractors State License Board (CSLB) of the State of California.

c. Holds a valid **Class C-22**, Asbestos Abatement Contractor license issued by the CSLB of the State of California, in accordance with Title 16, Division 8, Article 3 of the Business and Professions Code.

d. Possesses a valid State of California Contractors State License Board (CLSB) Certification **ASB (Asbestos Certification)** in accordance with the provisions of Division 3, Chapter 9 of the Business and Professions Code.

e. Is a current **Asbestos Registrant** with the California Department of Industrial Relations, Division of Occupational Safety and Health (DOSH), as required by Title 8 of the California Code of Regulations, Article 2.5.

f. Possesses a valid **USEPA Lead Safe** Certificate to conduct lead-based paint renovation, repair and painting activities pursuant to 40 CFR Part 745.89 and fulfilling the requirements of the Toxic Substance Control Act (TSCA) Section 402.

g. Possesses workers' documentation, medical records, and training required to perform the abatement Work.

h. Has no less than five years of experience in abatement and/or removal of Hazardous Materials

B. Other Abatement Principal Project Company's Qualifications

1. Before commencing any abatement Work, Principal Project Company shall submit to the City's Authorized Representative and SAR group within City Public Works Department a Hazardous Materials Management Plan (HMMP) in accordance to the requirements of this Section, and Section 02 80 13 Building Related Hazardous Materials Remediation.

2. Principal Project Company shall submit to The SAR group within City Public Works Department current licenses and certifications for the specific type of abatement Work to be performed; copies of regulatory agencies notifications, abatement work plans, workers and competent person's documentation, waste disposal plan and documentation as required for the removal of the Hazardous Materials.

C. Project Safety Representative: In accordance with the requirements specific to this Section, listed below, and in Section 01 35 45- Health and Safety Criteria, Principal Project Company shall provide a qualified Project safety representative that reports to the Principal Project Company's superintendent. The Project safety representative shall be trained to identify, control, and manage the Hazardous Materials on the Project Site. The Project safety representative shall:

1. Enforce safe work and hygiene practices in compliance with Principal Project Company's Health and Safety Program and Hazardous Materials Management Plan (HMMP)

2. Advise Principal Project Companys, vendors, and visitors to the Project Site of potential hazards and minimum general requirements of the Principal Project Company's Health and Safety Program

3. Coordinate Principal Project Companys' Work regarding Hazardous Material procedures and controls.

4. Establish and maintain restricted work areas.

5. Enforce proper use of personal protective equipment.

6. Communicate approved modified safety requirements to Project Site personnel as well as visitors to the Project Site.

7. Notify and coordinate with the City's Authorized Representative and The SAR group within City Public Works Department for the immediate assessment and remediation Work for unforeseen Hazardous Materials conditions discovered in the course of the Work.

8. Notify and coordinate signing of waste manifests with the City's Authorized Representative and Site Assessment and Remediation (SAR) group within City Public Works in a timely manner

9. Ensure Principal Project Company's personnel have proper training to perform the Work

D. Hazardous Materials Handlers: Only qualified persons may perform Hazardous Material- related Work. Principal Project Company shall ensure that all personnel who come into contact with, are exposed to, disturb, operate equipment or otherwise handle Hazardous Materials have appropriate hazard communication and required training, personal and medical monitoring, and are certified to wear appropriate personal protective equipment as required by applicable Laws. Special qualifications may be required depending on the Principal Project Company's means and methods.

E. For asbestos-related Work involving asbestos-containing material (ACM) equal to or greater than 100 square feet or 100 linear feet or affecting friable asbestos surfacing materials, thermal system insulation (TSI) and regulated asbestos-containing material (RACM), Principal Project Company or its Hazardous Materials abatement Principal Project Company shall:

1. Possess a valid asbestos handling license issued by the California State Contractors Licensing Board and a valid current certificate of registration for asbestos-related Work as issued by the California Department of Industrial Relations – Division of Occupational Safety and Health.

2. Ensure that all Work is completed under the on-site supervision of a "competent person" as defined by Federal OSHA under Regulation 29 CFR Part 1926.1101 and Cal/OSHA under 8 CCR 1529.

3. Ensure that all abatement workers have AHERA training with current annual eight-hour refresher training, annual medical exams for the use of respiratory protection, and a fit test of appropriate respirators every six months.

F. Lead Hazard Control Work: Principal Project Company shall ensure that only qualified persons with California Department of Public Health (CDPH) approved lead workers training, annual medical examinations and approval for the use of respiratory protection, and semi-annual fit testing of respirators under the direct supervision of a CDPH approved lead supervisor engage in Work defined under Cal/OSHA regulation 8 CCR 1532.1 affecting lead-based paints and lead construction hazards, including but not limited to:

1. Working in an environment where lead exposures exceed 30 micrograms per cubic meter (mg/m^3).

2. Controlling lead hazards, but not limited to, removal of loose and peeling lead-based paints, demolition and disposal of concrete-encased primed structural steel, removal of lead jacketed telephone cables and stripping of lead coatings from structural steel prior to torching or welding.

G. As required by Title 17, California Code of Regulations (CCR), Division 1, Chapter 8 "Accreditation, Certification and Work Practices in Lead-Related Construction," Article 1, Sections 35001 et al, and Article 16, Sections 36000 and 36100.Lead Hazard Work, Principal Project Company shall ensure that: all affected workers have lead awareness training, current medical examinations and approval for the use of respiratory protection, and current fit testing of respirators complying with Cal/OSHA regulation 8 CCR 1532.1 when affecting lead paints and lead construction hazards including:

1. Demolishing or salvaging structural items where lead or materials containing lead are present.

2. Removing or encapsulating materials containing lead.

3. Constructing, altering, repairing or renovating structures, substrates, or portions thereof, that contain lead or materials containing lead.

4. Installing of products containing lead.

5. Cleaning-up of lead contamination.

6. Transporting, disposing, storing, or containing lead or lead-containing materials on the site or other locations where construction and renovation activities are performed.

H. Polychlorinated Biphenyls (PCB) Related Work: Principal Project Company shall ensure that removal of non-leaking PSB-containing ballasts and transformers is completed by workers with PCB hazard-awareness training as verified by the Principal Project Company's Project Safety Representative. Removal of leaking or damaged PCB-containing ballasts, transformers, and oils shall be completed only by trained workers, wearing protective gloves and following safety procedures as outlined in the HMMP. Hazardous Waste shall be handled according to the U.S. Environmental Protection Agency's Standards 40 CFR 761.60 and 761.65, and 22 CCR Section 66699(b).

I. Mercury-Containing-Lamp-Related Work may be completed by workers with mercury hazard awareness training as verified by Principal Project Company's health and safety officer or superintendent.

J. Other Hazardous Materials-Related Work may be completed by workers with specific hazard-awareness training of the Hazardous Material in question as verified by the Principal Project Company's Project Safety Officer.

K. Contaminated Soils-Related Work including Underground Storage Tanks and CCA treated Wood: Principal Project Company shall ensure that workers have current 40-hour HAZWOPER training and 8-hour annual refresher training per regulation 29 CFR 1910.120, and 8 CCR 5192. Principal Project Company shall comply with the health and safety requirements, and the approved Site-Specific Hazardous Materials Management Plan (HMMP).

L. Bio-hazard Work: Principal Project Company shall ensure that Work areas contaminated with fecal matter and human excretions, along with needles and syringes and other materials potentially contaminated with infectious blood borne pathogens or other biohazards comply with the health and safety requirements and the approved in a Site-Specific Hazardous Materials Management Plan.

M. Mold and Fungi Remediation Work may be completed by workers with mold hazard awareness training as verified by the Principal Project Company's Project Safety representative.

N. Principal Project Company shall ensure that:

1. Hazardous Materials Haulers possess during the hauling of hazardous material, applicable federal, state, and local vehicle insurance requirements, valid driver's license, vehicle registration and licenses, and a current Class 1 Certification of Compliance from the California Highway Patrol affixed to each vehicle or container.

2. Hazardous Materials Haulers possess a Hazardous Substance Removal Certification granted by the State of California Department of Toxic Substances Control (510-540-3802) and other required certifications and insurance.

3. Drivers of Hazardous Materials hauling vehicles are informed about:

a. The nature of the material hauled.

b. Any recommended or required routes to and from the Project Site.

c. Applicable city street use regulations and requirements, and State of California Department of Transportation (Caltrans) codes, regulations and requirements.

d. The SAR group within City Public Works Department's requirements for proper handling and transportation of Hazardous Waste including mitigation controls and manifesting procedures.

e. The legal maximum loads for each vehicle.

1.5 REGULATORY REQUIREMENTS

A. Principal Project Company shall comply with the procedures of this Section, and applicable Law regarding the generation, management, characterization, removal, abatement, remediation, transportation and disposal of Hazardous Materials. Principal Project Company is solely responsible for identifying which apply. Examples of regulations that may apply include:

1. Resources Conservation and Recovery Act, 42 U.S.C. Section 6901 et seq.

2. Regulations 40 CFR Part 260 et seq.

3. California Health and Safety Code, Division 20.

4. Regulations, and 22 CCR Section 66000 et seq.

B. For asbestos (building materials) hazards, comply with the applicable requirements of the following federal, State and local regulations and requirements:

1. For asbestos hazards: Principal Project Company shall comply with the applicable requirements of:

a. Cal/OSHA Construction Asbestos Standard, 8 CCR Section 1529.

b. BAAQMD Regulation 11, Rule 2 and Regulation 11 Rule 14.

c. Environmental Protection Agency NESHAP and AHERA regulations (40 CFR Part 763, as applicable).

d. Occupational Safety and Health Administration (inclusive of OSHA 29 CFR 1926.1101).

e. California Environmental Protection Agency (Cal/EPA) Title 22.

f. Other applicable federal, State, and local governmental Laws pertaining to asbestos-containing materials (ACM) and asbestos waste.

g. The Final Regulation Order of the California Code of Regulations (CCR) Title 17, Public Health, Section 93105, on Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations.

h. All other applicable Laws, regulations, rules, ordinances, guidance documents and regulatory clarification letters and memos related to asbestos, Asbestos-Containing Materials (ACM), Asbestos Containing Building Materials (ACBM), Asbestos Containing Construction Materials (ACCM), and asbestos-containing waste.

2. For Naturally Occurring Asbestos (NOA) in on-site soil and fill, refer to Section 02 81 10 – Management of Excavated Materials, and Principal Project Company shall comply with the applicable requirements of:

a. Cal/OSHA Construction Asbestos Standard, 8 CCR Section 1529.

b. Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (CCR 17, Section 93105).

c. Bay Area Air Quality Management District (BAAQMD) rules, permits, notification forms, and regulatory information regarding Naturally Occurring Asbestos (NOA). (http://www.baaqmd.gov/permits/asbestos/naturally-occuring-asbestos)

d. Guidelines for Geologic Investigations of Naturally Occurring Asbestos in California, Special Publication 124, California Geologic Survey (http://www.capcoa.org/Docs/noa/%5B24%5D%20CA%20Geol%20Survey%20Asbestos%20Guidelines.pdf).

e. Determination of Asbestos Content of Serpentine Aggregate, Method 435", California Air Resources Board (https://www.arb.ca.gov/toxics/asbestos/tm435/workshops/m435-asbestosguidance-appacd2017.pdf.

f. Implementation Guidance Document, Air Resource Board Test Method 435, Determination of asbestos Content of Serpentine Aggregate- Field and Laboratory Practices: CARB Monitoring and Laboratory Division, Quality Management Branch, Quality Management Section (https://www.arb.ca.gov/toxics/asbestos/tm435/guidancedocument.pdf.

g. Asbestos and Other Fibers by Phase Contrast Microscopy (PCM), NIOSH Method 7400 (https://www.cdc.gov/niosh/docs/2003-154/pdfs/7400.pdf).

h. Asbestos by Transmission Electron Microscopy (TEM), NIOSH Method 7402 (https://www.cdc.gov/niosh/docs/2003-154/pdfs/7402.pdf).

i. All other applicable Laws, regulations, rules, ordinances, guidance documents and regulatory clarification letters and memos related to Naturally Occurring Asbestos, asbestos, and Asbestos-Containing Materials (ACM), and asbestos-containing waste.

C. For lead hazards, Principal Project Company shall comply with the applicable requirements of the following federal, State and local Laws:

1. Cal/OSHA Lead in Construction Standard, 8 CCR Section 1532.1 (https://www.dir.ca.gov/title8/1532_1.html), and Cal/OSHA Lead in Construction Standard (Fact Sheet) (https://www.dir.ca.gov/dosh/dosh_publications/lead-fct-sheet-rev.pdf).

2. Cal/EPA Regulation 22 CCR Section 66000 (https://www.dtsc.ca.gov/LawsRegsPolicies/Title22/).

3. Federal Lead Standard for the Construction Industry, 29 Code of Federal Regulations (CFR) part 1926.62

4. California Department of Health Services (17 CCR Sections 35001 -35099).

5. Title 17, California Code of Regulations, Division 1, Chapter 8 Accreditation, Certification and Work Practices in Lead Related Construction.

6. Lead as a water pollutant:

    a. Federal Clean Water Act (CWA), 40 CFR part 427.

    b. California's Porter Cologne Water Quality Control Act.

7. Federal Safe Drinking Water Act (SDWA), 40 CFR parts 141-143.

8. Lead as a hazard to children: California's Childhood Poisoning Prevention Act, 17 CCR section 33001 et seq.

9. Lead as a waste:

    a. Federal Resource Conservation and Recovery Act (RCRA) of 1976,

    b. 40 CFR part 240 et seq.

    c. California's Hazardous Waste Control Law (HWCL), 22 CCR section 66260.1 et seq.

10. San Francisco Building Code (SFBC), Chapter 34, as required where there is disturbance to painted surfaces on the exterior of buildings or structures within the City and County of San Francisco.

11. Society for Protective Coatings Paintings Principal Project Companys' Certification Program (SSPC/PCCP) for the QP1 and QP2 Certifications.

D. Respiratory Protection: Principal Project Company shall assess potential exposures to Hazardous Materials and conditions and comply with Cal/OSHA Regulations included in 8 CCR Sections 1529, 1532.1, and 5144, ANSI Standard Z88.2 - "Practices for Respiratory Protection", and 29 CFR 1926.62 (f). Principal Project Company shall ensure that workers wear appropriate respiratory protection during lead, asbestos and any other hazardous Work, unless negative exposure assessment testing verifies that worker exposures are below the PEL or Action levels.

E. For PCB work: Principal Project Company shall comply with Cal/EPA Regulation 22 CCR Sections 66268.110 and 66508, and 40 CFR 761.

1. https://www.epa.gov/pcbs/polychlorinated-biphenyls-pcbs-building-materials#Information-Contractors

F. For universal waste, Principal Project Company shall comply with Cal/EPA Regulation 22 CCR Sections 66261.50 and 66273.8 (CCR Title 22, Division 4.5, Chapter 34). Examples of universal waste: batteries, fluorescent tubes (lamps), electronic devices (cell phones,

computers, televisions), cathode ray tubes (CRTs), mercury wastes (thermometers and toys), and non-empty aerosol cans.

G. For wood treated with chemical preservatives, such as chromate copper arsenate (CCA) treated wood: Principal Project Company shall comply with the federal insecticide, fungicide, rodenticide Act (FIFRA) and by the California Department of Pesticide Regulation (DPR) and Department of Toxic Substances Controls (DTSC) Regulations or for the treated wood waste as per the Health and Safety Code (HSC) 25150.7 and 25150.

1.6 DEFINITIONS

A. Lead Abatement: as defined by the Department of Public Health for lead hazard work, includes any set of measures designed to reduce or eliminate lead hazards or lead-based paint, but excludes containment or cleanup. Abatement for lead is designed to permanently reduce or eliminate lead hazards for public (non-industrial) buildings or to last more than 20 years.

B. Asbestos-Containing Material (ACM) for the purpose of Cal/OSHA compliance: Any material that contains more than 1% asbestos by weight for the purposes of abatement, waste disposal and fiber controls specified under this Agreement.

C. Asbestos-Containing Material (ACM) for the purposes of CARB compliance under the ATCM: Any material that has an asbestos content of 0.25% or greater.

D. Asbestos Containing Construction Materials (ACCM): Defined by Cal OSHA 8CCR§341.6 as any manufactured construction material which contains more than 0.10 % asbestos by weight.

E. Asbestos Regulated Area: An area established where asbestos disturbance work is conducted and any adjoining area where disturbed material, debris and waste from such asbestos work occurs or is accumulated; and a work area within which airborne concentrations of asbestos exceed, or there is reasonable possibility that may exceed the permissible exposure limit (PEL).

F. Asbestos-Related Construction Work: Defined by Cal OSHA 8CCR§1529 as construction work that includes the following:

1. Demolition or salvage of structures where asbestos is present;

2. Removal or encapsulation of materials containing asbestos;

3. Construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof, that contain asbestos;

4. Installation of products containing asbestos;

5. Asbestos spill/emergency cleanup;

6. Transportation, disposal, storage, containment of and housekeeping activities involving asbestos or products containing asbestos, on the site or location where construction activities are performed;

7. Excavation and any disturbance of rock, soil, alluvium, or fill that may involve exposure to asbestos as a natural constituent that is not related to asbestos mining and milling activities;

8. Erection of new electric transmission and distribution lines and equipment, and alteration, conversion and improvement of the existing transmission and distribution lines and equipment; and

9. Routine facility maintenance.

G. BAAQMD: Bay Area Air Quality Management District (Air District) is a regional agency with jurisdiction over the demolition and renovation of buildings and structures that may contain asbestos, and the manufacture of materials known to contain asbestos. BAAQMD regulations must always be followed when removing asbestos or demolishing buildings. The Air District has been delegated the authority to enforce federal asbestos regulation. The Air District developed its own asbestos rule in 1976 that is more stringent than the federal rule.

H. Cumulative Renovations: A series of small (less than 30.8 m [100 feet] linear, 9.4 m^2 [100 ft^2] or 1 m^3 [35 ft^3]) renovations or removals of RACM performed during a calendar year at a single plant or facility which, taken together, would add up to a reportable amount under the provisions of BAAQMD Regulation 11, Rule 2.

I. Demolition: Defined by BAAQMD as wrecking, intentional burning, moving or dismantling of any load supporting structural member, or portion thereof, of a building, facility or ship. This includes, but is not limited to, any related cutting, disjointing, stripping or removal of structural elements.

J. Deteriorated Lead-Based Paint Hazard: painted areas with any of the following characteristics:

1. More than two square feet of deteriorated lead paint on interior components with large surfaces such as walls, ceilings, floors, and doors.

2. More than ten square feet of deteriorated lead paint on exterior components with large surfaces such as outside walls.

3. Deteriorated lead paint on more than ten percent of the total surface area of interior or exterior components with small surface areas such as windowsills, baseboards, trim, etc.

K. Lead Activities: Lead hazard evaluation, lead-related construction work, or any activity which disturbs lead-based paint, presumed lead-based paint, or creates a lead hazard

L. Lead Action Level: 30 micrograms per cubic meter based on an eight-hour time-weighted average (8 hr. TWA).

M. Lead-Based Paint (LBP): LBP is defined in Title 17, CCR Division1, Chapter 8, Section 35033 as any paint, varnish, shellac, or other surface coating that contains lead equal to or greater than 1.0 mg/cm^2 as measured by X-ray Fluorescence (XRF) or laboratory analysis, or 0.5 percent by weight (5,000 µg/g, 5,000 ppm, or 5,000 mg/kg) as measured by laboratory analysis.

N. Lead--Based Paint Activities: EPA's Title IV of the Toxic Substances Control Act defines Lead-Based Paint Activities as the following, among others:

O. In any public building constructed before 1978, commercial building, bridge, or other structure or superstructure:

1. Identification of lead-based paint and materials containing lead-based paint

2. De-leading

3. Demolition

P. Lead-Based Paint Debris: Any component, fixture, or portion of a building coated wholly or partly with LBP. LBP debris can also be any solid material coated wholly or partly with LBP resulting from a demolition. Examples among many others include ceilings, crown molding, walls, chair rails, doors, door trim, floors, fireplaces, shelves, and radiators, jacketed telephone cables and other heating units.

Q. Lead-Based Paint Hazard: A condition in which exposure to lead from lead-contaminated dust, lead-contaminated soil, or deteriorated lead-based paint would have an adverse effect on human health (as established by the EPA Administrator under Title IV of the Toxic Substances Control Act). Lead-Based paint hazards include for example, deteriorated lead-based paint, leaded dust levels above applicable standards, and bare leaded soil above applicable standards.

R. In Title 17, California Code of Regulations (CCR), Division 1, Chapter 8, Section 35037, the California Department of Public Health (CDPH) adds to this definition by stating "disturbing lead-based paint or presumed lead-based paint without containment, or any other nuisance which may result in persistent and quantifiable lead exposure."

S. Lead-Based Paint Hazard Abatement: Any set of measures designed to permanently eliminate lead-based paint hazards according to standards established by the appropriate federal agencies. Abatement measures include the following activities:

1. Removal of lead-based paint and lead-contaminated dust,

2. Permanent containment or encapsulation of lead-based paint,

3. Replacement of lead-painted surfaces or fixtures, and

4. Removal or covering of lead-contaminated soil.

5. Removal also includes all associated preparation, cleanup, disposal, and post-abatement clearance testing activities, record keeping, and monitoring.

T. Lead-Based Paint Hazard Control: Activities to control and eliminate lead-based paint hazards, including interim controls, abatement, and complete abatement.

U. Lead-Contaminated Dust: Surface dust containing an area or mass concentration of lead in excess of the standard established by the EPA Administrator, pursuant to Title IV of the Toxic Substances Control Act. CDPH's threshold limits are as follows: 10 $\mu g/ft^2$ on interior floors, 100 $\mu g/ft^2$ on interior horizontal window surfaces, and 100 $\mu g/ft^2$ on exterior floors and exterior horizontal window surfaces. The most stringent criteria set forth by CDPH and/or the EPA shall apply to the work on this project

V. Lead-Containing Material: Any material, coating, substrate or product, which contains any measurable amount of lead, with the definition of lead being in accordance to OSHA's definition.

W. Lead Hazard: Title 17, California Code of Regulations (CCR), Division 1, Chapter 8, sections 35000 -36100, the California Department of Public Health (CDPH) defines: lead hazard as deteriorated lead-based paint, lead contaminated dust, lead contaminated soil, disturbing lead-based paint or presumed lead-based paint without containment, or any other nuisance which may result in persistent and quantifiable lead exposure.

X. Lead Permissible Exposure Limit (PEL): 50 micrograms per cubic meter based on an eight-hour time-weighted average (8hr. TWA).

Y. Lead Related Construction Work: Any construction, alteration, painting, demolition, salvage, renovation, repair, or maintenance of any residential or public building, including preparation and cleanup that, by using or disturbing lead-containing materials or soil, may result in significant exposure of adults and children to lead.

Z. Presumed Asbestos Containing Material (PACM) is thermal system insulation and surfacing material found in buildings constructed no later than 1980. PACM can be sampled to confirm whether it is ACM or not.

AA. Project Safety Representative (PSR): Qualified person directly responsible under Principal Project Company's Superintendent having the necessary training to be knowledgeable in the identification, control, and management of the hazardous materials/waste on site, and health and safety. See Section 1.4(C) above for further definition.

1.7 PROJECT REQUIREMENTS

A. Principal Project Company shall ensure that all Project personnel, including Principal Project Company's personnel, receive awareness training and orientation suitable to prevent inadvertent or unauthorized disturbance of Hazardous Materials that are present at the Project Site.

B. If Hazardous Material, including Naturally Occurring Asbestos (NOA), not identified on the survey report is discovered, Principal Project Company shall immediately notify the City's Authorized Representative and the SAR group within City Public Works Department both verbally and in writing.

C. Lead Hazards: All Construction Work that disturbs or affects intact paint and materials containing any detectable level of lead shall be performed by Principal Project Company under the Cal/OSHA Lead in Construction Standard 8 CCR 1532.1, Federal/OSHA's Lead Standard for the Construction Industry, Title 29 Code of Federal Regulations 1926.62, as well as all applicable Federal, State, and Local regulations. OSHA Lead in Construction Standard (29 C.F.R. part 1926.62 and title 8 CCR section 1532.1) requires awareness training and compliance on the part of an employer when there is any possibility that an employee could be exposed to lead as a result of his or her activities.

D. Principal Project Company is prohibited from starting Hazardous Material removal Work without approved Hazardous Materials Submittals as described in Section 02 80 13. Principal Project Company shall not conduct any sampling or analysis of suspected building materials without prior permission from the City as Regulator. Principal Project Company shall ensure that only qualified AHERA certified building inspectors for asbestos sampling and the California Department of Public Health (CDPH) certified Project monitors for lead assessment are allowed to conduct the sampling.

E. Pursuant to 29 CFR 1926.1101, Principal Project Company shall be deemed to exercise general supervisory authority over the Work covered by the standard, even though the Principal Project Company is not qualified to serve as the asbestos "Competent Person," as defined by the standard. As supervisor of the entire Project, the Principal Project Company shall ascertain whether any Principal Project Company is in compliance with the standard and shall require such contractor to come into compliance with the standard when necessary. Principal Project Company shall provide competent supervision by a designated Project Safety Representative (PSR) who can identify potential hazards at the Project Site and oversee implementation of appropriate protective measures to comply with all Cal/OSHA requirements applicable for Hazardous Materials.

F. Principal Project Company is responsible for the general supervisory authority over all Hazardous Materials activities, both incidental and primary, for the demolition, renovation and Construction Work under this Agreement.

G. Principal Project Company shall coordinate the activities that may have the potential to directly or indirectly impact Hazardous Materials. Work that may typically impact Hazardous Materials includes, as applicable and is not limited to:

1. Demolition.

2. Disturbance to any paints or coatings.

3. Torch cutting.

4. Welding.

5. Excavation.

6. Dewatering.

7. Shoring and Underpinning Work.

H. Principal Project Company shall not create any condition that may endanger the health and safety of City employee's and its representatives, facility staff, construction workers, site visitors, outside consultants, and the general public, including exposure to hazardous materials. If the City's Authorized Representative or City as Regulator observes such conditions, then the City' has the authority to suspend Work until Principal Project Company corrects the condition as provided.

I. Principal Project Company and its personnel shall have all the applicable hazard determination, exposure assessment, medical surveillance, engineering and work practice controls, respiratory protection, protective clothing and equipment, employee information and training, certifications, and monitoring program necessary to perform the Work and as required by Law and the Codes.

J. Clean up, remediation and disposal of any Hazardous Materials disturbed during this Work shall be the responsibility of Principal Project Company. The level of engineering control and medical monitoring required shall be based on the governing regulations of Cal/OSHA that are effective for the Project Term for the level and extent of hazards exposure at the site.

K. Principal Project Company shall maintain all Work areas within and outside the Project boundaries free from environmental pollution, which would be in violation of any federal, State or local Laws. Principal Project Company shall conduct Construction Work in strict compliance with the Contract Documents, including this Section and other related Sections.

1. The Project Schedule shall include work shifts for asbestos, lead-based paint, PCB ballast, PCB Building Materials, and other abatement as indicated.

L. As per Health and Safety requirements specified under Section 01 35 45, Principal Project Company is responsible for monitoring its employees and Contractors' and Sucontractors' employees for exposure to Hazardous Materials, either used in construction or otherwise uncovered or intrinsically present at the Project Site.

M. Principal Project Company shall not remove Hazardous Materials unless properly trained and certified for the handling of the Hazardous Materials encountered. (For example: workers trained and certified for Class I Asbestos Work with accordance to Title 8 CCR Section 1529).

1.8 WASTE HANDLING AND CHARACTERIZATION

A. Principal Project Company shall submit to the City as Regulator a Waste Management Plan (WMP) as specified under Section 02 80 13 Building Related Hazardous Materials Remediation.

B. Principal Project Company shall characterize and profile the waste to ensure proper handling, transportation and disposal. Principal Project Company shall handle, transport and dispose of the waste.

C. Principal Project Company shall segregate all waste streams. Principal Project Company shall accurately identify waste in accordance with all applicable Law and Codes. Individual waste containers must be labeled in accordance with Cal/OSHA labeling requirements.

D. Principal Project Company shall obtain and pay for all sampling and profiling analyses required for waste disposal. Principal Project Company shall ensure that California CDPH-accredited laboratories perform analyses. Principal Project Company shall submit results of such analyses to the City as Regulator prior to scheduling the waste off haul.

E. Principal Project Company shall ensure that all waste remains stored on the Project Site in a secured and designated waste storage area until results of waste characterization tests are available. Due to the time required to perform some analytical tests, this may require storage for up to 10 Working Days or more.

F. Principal Project Company shall ensure that all contaminated and non-friable waste is hauled off the Project Site using a bill of lading approved by the City as Regulator, to an approved treatment/disposal facility, in accordance with all applicable Federal, State and local regulations.

G. Principal Project Company shall provide and prepare a bill of lading and the non-hazardous waste manifest form for each shipment of material from the site. The bill of lading shall describe the contents of each truck carrying materials to the waste disposal site, including the name, address and phone number of the ultimate disposal site, the weight or yardage of the waste materials (as applicable), original location of the material, and an emergency phone number. Principal Project Company shall ensure that the hauler signs and dates the bill of lading indicating that he/she has accepted the load described in the manifest on that day. The City will sign the bill of lading before off haul and will retain the generator's copy. Principal Project Company shall provide copies of bills of lading accepted by the treatment/disposal sites to the City's Authorized Representative and City as Regulator. Principal Project Company shall follow manifesting procedures for the transportation and disposal of Class II material or lesser as specified this Section.

H. Principal Project Company shall provide and prepare a Hazardous Waste manifest for each shipment of Hazardous Material determined from the Project Site. The manifest shall describe the contents of each truck carrying materials to the waste disposal site, including the name, address, and phone number of the ultimate disposal site, the weight or yardage of the waste materials (as applicable), original location of the material, and an emergency phone number. Principal Project Company shall ensure that the hauler signs and dates the manifest indicating that it has accepted the load described in the manifest on that day. The Site Assessment and Remediation (SAR) group within City Public Works Department will sign the manifest before off haul and retain the generator's copy. Principal Project Company shall provide copies of manifests accepted by the treatment/disposal sites to the City. Principal Project Company shall follow Hazardous Waste manifesting procedures for the transportation and disposal of Hazardous Material.

I. Principal Project Company shall package, label, transport, and dispose of Hazardous Waste in accordance with applicable Cal/EPA regulations under Title 22 CCR and the California Health and Safety Code, including completion of the Uniform Hazardous Waste Manifest (UHWM). Information on the UHWM must include the quantity of waste in cubic yards and the name and address of the BAAQMD to comply with EPA Waste Shipment Record requirements. Principal Project Company shall follow the waste disposal; and manifesting requirements as specified this Section.

J. Principal Project Company shall provide and prepare the bill of lading, the non-hazardous waste manifest form, and the Hazardous Waste manifests forms by typing in a neat, correct, and legible fashion for signing by the generator. Principal Project Company shall notify the City's Authorized Representative and the SAR team within City Public Works Department at least 48 hours in advance of the time at which the manifest is ready to be signed.

K. Principal Project Company shall ensure that all lead-containing waste or debris, including, but not limited to, painted building components, ceramic tile glazes, jacketed telephone cables, respirator cartridges, disposable suits, and other associated debris generated during this work,

is packaged for disposal as Hazardous Waste until waste characterization has been completed and analytical results are available. Waste shall be segregated into distinct waste streams according to the waste categories suggested in the Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, (a.k.a. "the HUD Guidelines"), dated June 1995 (Revised July 2012), which include the following:

1. Category I: Low Lead Waste – typically non-hazardous construction materials, filtered wash water, cleaned plastic sheeting, and other items that test as non-hazardous;

2. Category II: Architectural components, such as painted finished items like siding, doors, windows, trim, etc. which demonstrate intact or stabilized surface coatings;

3. Category III: Concentrated Lead Waste - typically hazardous materials such as paint sludge, paint chips vacuum debris, vacuum filters, and any waste testing hazardous; and

4. Category IV: Other lead-containing waste requiring characterization testing.

L. Disposal of intact lead-coated architectural or structural elements may occur as non-hazardous waste in accordance with Cal/EPA's and the Department of Toxic Substance Control's requirements.

M. Principal Project Company shall ensure that waste characterization for lead hazard content is performed in accordance with 22 CCR §66262, ET. seq., including using one or more of the following testing procedures, as required, and is manifested and properly disposed:

1. Total Threshold Limit Concentration (TTLC)

2. Waste Extraction Test (WET)

3. Toxicity Characteristic Leaching Procedure (TCLP)

4. SW 846

N. Miscellaneous Hazardous Waste Disposal. Principal Project Company shall comply with the following:

1. Disposing of PCB-containing ballasts in landfills is prohibited by Federal and State Law. Drums containing PCB ballasts and other PCB-contaminated materials must be disposed of, or otherwise treated, at an EPA-approved facility.

2. Ballasts with "Non-PCB" fluids, must be disposed of at a legally permitted disposal/recycling facility as assumed DEHP-containing ballasts.

3. Fluorescent lamps must be stored in packaging or containers that are designed to minimize breakage/damage during both storage and shipping. Containers shall be labeled as "Universal Waste – Spent Fluorescent Lamps" or "Universal Waste," as appropriate, and each container shall be marked with the date on which storage of said waste began.

4. Principal Project Company shall use a bill of lading or non-hazardous waste form that contains the following information when shipping fluorescent lamps to a recycler: name and address of generator, transporter, and recycler; number of lamps shipped; date of shipment and date of receipt by recycler; and obtain a dated signature of the receiving recycler. A copy of the bill of lading shall be submitted to the City's Authorized Representative and SAR group within City Public Works Department at abatement completion.

O. Universal Waste Disposal

1. Principal Project Company shall comply with the following universal wastes specific disposal procedures under 22 CCR 66273.10 through 66273.21:

   a. Batteries, as described in section 66273.2, subsection (a);

   b. Electronic devices, as described in section 66273.3, subsection (a);

   c. Mercury-containing equipment, as described in section 66273.4, subsection (a);

   d. Lamps, as described in section 66273.5, subsection (a) (including, but not limited to, M003 wastes);

   e. Cathode ray tubes, as described in section 66273.6, subsection (a);

   f. Cathode ray tube glass, as described in section 66273.7, subsection (a); and

   g. Aerosol cans, as specified in Health and Safety Code section 25201.16.

2. Principal Project Company shall ensure that universal wastes are segregated and shipped for disposal following DOT shipping requirements in 49 CFR 171 through 180.

3. Universal Wastes can be shipped using a bill of lading to a Universal Waste Handler licensed under the requirements of 22 CCR 66273.

P. Asbestos Waste Disposal

1. A waste that is friable and contains asbestos over 1 percent is regulated as a California (Non-RCRA) hazardous waste under 22 CCR 66261.24*.* Principal Project Company shall characterize and profile asbestos-containing waste to determine its correct waste disposal classification.

2. Principal Project Company shall comply with the following requirements that apply to transportation and disposal of asbestos Hazardous Waste:

   a. Packaging in sealed, leak-tight, non-returnable containers from which the fibers cannot escape following 40 CFR 61.150 or, in order to prevent breakage of larger items, in bulk containers lined with plastic sheeting and covered it with a tarp following 22 CCR 66263.23.

   b. Labeling of the asbestos Hazardous Wastes shall follow 29 CFR 1910.1001, 29 CFR 1926.1101, and 8 CCR 5208.

   c. Asbestos Hazardous Wastes shall be shipped using a registered hazardous waste hauler to landfills permitted to accept asbestos wastes.

   d. d) Principal Project Company shall provide, prepare and submit to the City's Authorized Representative and SAR group within City Public Works Department a Uniform Hazardous Waste Manifest Form for asbestos Hazardous Waste shipments.

1.9 USE OF NON-HAZARDOUS WASTE MANIFEST FOR CLASS II MATERIAL OR LESSER For the profiling of each waste stream, Principal Project Company shall fill out the waste acceptance profile form, set up an account, and obtain the waste profile number from the landfill provider.

B. For transportation and disposal of the waste, Principal Project Company shall provide and prepare for the City's Authorized Representative and City as Regulator a non-hazardous waste

manifest form obtained from the landfill provider. The non-hazardous waste manifest form shall be completed for each vehicle carrying excavated material classified as California Class II non-RCRA waste, or of a lesser waste classification. Principal Project Company shall submit each non-hazardous waste manifest form to the SAR group within City Public Works Department for the generator's signature at least 72 hours in advance of the day of the off-haul with an estimate of the number of loads scheduled for off-haul. The non-hazardous waste manifest form shall contain the following information before providing the final copy for the City as Regulator to sign:

1. Name, address and phone number of the generator, Project name, and Specification Section number.

2. Principal Project Company's billing information

3. Name, address and phone number of the transport company.

4. The Name, address, and telephone number of the receiving facility i.e., disposal facility.

C. The City will not be responsible for off haul delays if Principal Project Company does not notify the City in a timely manner to sign the non-hazardous waste manifest forms.

D. Within 30 days of the off haul, Principal Project Company shall submit to the City's Authorized Representative and SAR group within City Public Works Department with copies of each completed non-hazardous waste manifest Form (with the landfills signature).

E. Principal Project Company shall furnish all labor, materials, equipment, and incidentals required to transport those materials identified as non-hazardous waste for the purpose of disposal.

F. Principal Project Company shall prepare waste characterization and profiling information documenting the non-hazardous nature of the category of waste.

G. By the end of the workday, Principal Project Company shall prepare bills of lading for each vehicle for all excavated material loads classified as non-hazardous waste (California Class II or lesser), for the purpose of off-site transportation and disposal purposes. The bill of lading shall be designed to contain the following information:

1. Name, address and phone number of the transport company

2. Name of the driver, a dated signature from the driver, vehicle license number, trip number.

3. Weight as recorded at the landfill of waste excavated material.

4. Date of transport.

5. Name, address and phone number of the receiving facility i.e., disposal facility. A dated signature from the receiving facility.

6. Name, address and phone number of the generator, along with the Contract No. and Project name.

H. A copy of each bill of lading and a certified weight ticket is an indication of the weight of the shipment, which has been received at the disposal facility. Principal Project Company shall maintain files of all bills of lading and furnish such information to the City if requested.

I. Principal Project Company shall ensure that the transporter signs and dates the bill of lading indicating that the transporter accepted the load described in the bill of lading on that day for that particular trip.

1.10 HAZARDOUS WASTE MANIFESTING PROCEDURES FOR CLASS I MATERIAL

A. Principal Project Company shall furnish all labor, materials, equipment, and incidentals required to transport those materials identified as Hazardous Waste for the purpose of disposal.

B. Principal Project Company shall comply with all applicable regulatory requirements listed as well as other applicable federal, State, and local lLaws, codes, and ordinances, which govern or regulate transportation of wastes (including DOT-HM 181 in accordance with 49 CFR 172).

C. Principal Project Company shall ensure that all packing, labeling, transporting, and disposing of Hazardous Waste complies with regulations under 22 CCR, including providing and completing the Uniform Hazardous Waste Manifest Form.

D. Principal Project Company shall follow applicable regulations under 40 CFR Part 263, and 22 CCR Section 66263, “Standards Applicable to Transporters of Hazardous Waste,” including licensing, manifest system, record keeping, and discharges.

E. Principal Project Company shall ensure that all material classified as Hazardous Waste (Federal Class1 RCRA and California Class1 non-RCRA wastes only) is hauled off using a licensed Hazardous Waste transporter and the uniform Hazardous Waste manifest form (DTSC Form 8022A and/or EPA Form 8700-22 a.k.a. the manifest).

F. Preparation and handling of waste manifests

1. Principal Project Company shall provide and prepare the waste manifests and landfill profiles for each shipment of Hazardous Wastes from the site. Principal Project Company is hereby notified that Hazardous Waste manifest, waste profiling, and landfill service agreements have to be prepared and have to be approved by the landfill in advance of the off-haul. Principal Project Company shall consult with the SAR group within City Public Works Department for local requirements in filling out the forms.

    a. The manifest prepared by the Principal Project Company shall describe the contents of each truck carrying materials to the waste disposal site, including the weight of the waste materials.

    b. The City as Regulator will provide a hazardous waste generator identification number for use on the manifest. Principal Project Company shall provide the State Transporter identification number and telephone number.

    c. Principal Project Company shall ensure that the licensed transporter also signs and dates the manifest indicating that it has accepted the load described in the manifest on that particular day.

    d. Only a DOT Certified City employee (and not Principal Project Company) will sign the manifest for the “generator” of the waste.

2. Principal Project Company shall notify the SAR group within City Public Works Department and the City ’s Authorized Representative 72 hours prior to off-haul of all excavated material. Off-haul shall occur between the hours of 8:00 a.m. and 4:30 p.m. Monday through Friday (excluding City holidays).

3. The SAR group within City Public Works Department will sign and keep the generator's copy of the manifest and give the remaining copies to the licensed transporter.

4. The licensed transporter shall carry the hazardous waste manifest with each truckload using the traffic control approved routes for off haul.

5. Within 2 days of its return, Principal Project Company shall provide the SAR group within City Public Works Department with the completed waste manifest. The completed waste manifest shall be certified by the receiver of the waste shipment, confirming that the shipment was received at the waste treatment or disposal facility designated in Principal Project Company's bid, and certifying the weight of the shipment.

6. Should any waste manifest not be returned within 35 days of shipment, Principal Project Company shall initiate follow-up, shall document such follow-up effort in writing with an Exception Report in accordance with 40 CFR 262.42 and/or 22 CFR 66262.42, and shall provide a copy to the SAR group within City Public Works Department and the City ’s Authorized Representative.

G. Mandatory City Information for the Manifest

1. Principal Project Company shall use the following information for preparing a manifest form:

a. Manifest Item 1: Generator’s US EPA ID Number for Project: CAD982008120

b. Manifest Item 3: Emergency response Phone: A 24 hour phone line shall be provided by Principal Project Company

c. Manifest Item 5:

1) Generator’s Name and Mailing Address:
City and County of San Francisco
Department of Public Health/BEHM
1390 Market St., Suite 210
San Francisco, CA. 94102

Generator’s Site Address:
City and County of San Francisco
To be provided by the City

d. Manifest Item 14: The following information is mandatory:

1) Name of Project

2) Project Manager

3) Project Manager Phone Number #

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 35 45 - HEALTH AND SAFETY CRITERIA

PART 1 - GENERAL

1.1 SUMMARY

A. Comply with legal and regulatory requirements applicable to the health and safety of persons during the performance of the Work and at the Project Site.

B. **Work on the Project Site may commence only after the City accepts the Project's Health and Safety Plan (HASP).**

C. Principal Project Company shall be solely responsible for:

1. Complying with the terms of this Section.

2. Developing, submitting, implementing, maintaining, and enforcing a site-specific Health and Safety Plan (HASP).

3. Posting all OSHA-required notices and establishing a safety program for the Work.

4. Complying with all applicable Cal/OSHA training, safety device, reporting, Work performance requirements.

5. Determining and complying with all applicable health and safety requirements, in accordance with applicable Laws.

6. Determination and implementation of construction means, methods, techniques, sequences, and procedures, including all safety precautions, training and programs taken in connection with the Work, as well as coordinating all portions of the Work.

7. The health and safety of Principal Project Company's employees, Principal Project Companys, and visitors as set forth in applicable Laws.

8. Implementing, maintaining, and enforcing all safety precautions and programs concerning the Work.

9. Conducting air monitoring at the Project Site for Principal Project Company's personnel and Principal Project Companys' personnel, as required by applicable Laws. The City as Regulator may conduct ambient air monitoring as it deems necessary.

10. Payment of all fines, penalties or damages that result from Principal Project Company's failure to comply with applicable health and safety Laws.

D. The health and safety requirements set forth in this Section are not a comprehensive list of safety requirements that may apply to Work. And, some of the specified requirements may not apply to the Work, depending on the type and scope of the Work.

E. The City as Regulator will neither assume the administration of nor direct, control or otherwise assume any responsibility for the implementation and enforcement of the Principal Project Company's health and safety program.

F. Principal Project Company shall be solely responsible and shall assume all liability for compliance with the safety orders, regulations, and requirements of:

1. Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.)

2. Construction Safety Orders (8 CCR, subchapter 4 et seq.)

3. Federal OSHA.

4. Cal/OSHA.

5. California Public Utilities Commission (CPUC).

6. State of California Public Utilities Commission, General Order No. 172, Rules and Regulations Governing the Use of Personal Electronic Devices by Employees of Rail Transit Agencies and Fixed Guideway Systems.

7. The State of California Wireless Communications Device Law (effective January 1, 2009) makes it an infraction to write, send, or read text-based communication on an electronic wireless communications device, such as a cell phone, while driving a motor vehicle.

8. California Vehicle Code.

9. Local regulations pertaining to Work practices, protection of workers and visitors to the site.

G. Nothing contained in this Agreement shall relieve Principal Project Company, or any Principal Project Company or Supplier, from the obligations set forth above and obligations as required by applicable Laws. If a provision of this Section conflicts with any applicable provision of this Agreement or any federal, state, or local safety regulations, the more stringent requirements that maintain a greater level of safety shall apply.

H. Ensure all tiers of field personnel, employees, agents, visitors and Principal Project Companys:

1. Are provided the proper notifications, training, and procedures as required by the Project's Health & Safety Plan, including but not limited to the handling of unidentified Hazardous Materials.

2. Follow safe practices and minimize exposure when dealing with unanticipated and unidentified Hazardous Materials.

3. Minimize potential risks during Project construction by having all construction personnel follow the Project's Health & Safety Plan.

4. Provide and maintain personnel safety training and medical examinations in accordance with all applicable Law.

I. Conduct any required personal air monitoring of its workers, at its own expense Principal Project Company shall be responsible for providing its employees and visitors with all levels of personal protective equipment (PPE). Principal Project Company shall be responsible for providing its employees and visitors with all levels of training and PPE, including personal air monitoring if required. This includes areas where hazardous and contaminated soils and waste is encountered.

J. Principal Project Company shall have considered the productivity losses, if any, arising from the use of respirators and PPE.

1.2 JOB CONDITIONS

A. Performance of the Work involves working in environments that may be hazardous, contaminated, and non-hazardous. Serpentinite and other ultramafic rocks that contain naturally occurring asbestos may be present within earthen materials at the Project Site. Work that disturbs on-site rock and soil shall be performed under Cal/OSHA Class II procedures, as required by Cal/OSHA regulations (CCR Title 8 § 1529, asbestos in construction).

B. Such hazardous, contaminated, and non-hazardous environments include, but are not limited to; Hazardous Materials, non-hazardous materials, soils, groundwater and storm water, heavy metals (including lead), asbestos, serpentinite and other ultramafic rock that contains naturally occurring asbestos, respirable crystalline silica, lead containing paint and building materials, petroleum hydrocarbons, polynuclear aromatic hydrocarbons, organic compounds, railroad ties, sewage, sludge, debris, grit, sewer gases, oxygen deficiency, bacterial/biological contamination, odors from petroleum hydrocarbons, and other volatile/semi-volatile organic compounds and confined spaces.

C. Construct/finish, and at all times maintain satisfactory and substantial ramping, guard rails, warning flags, and signs at appropriate heights, temporary chain link fencing, solid fencing, railings, barricades, steel plates or bridging as applicable at all openings, obstructions, or other hazards in streets, sidewalks, pedestrian pathways affected by construction. All such barriers shall have adequate warning lights as necessary or required for public safety. Divert traffic by use of traffic cones, barriers, flagmen, flags, and signs adequate to conditions at the Project Site and task at hand. All temporary and permanent safety features shall be installed before beginning commencing Work at the Project Site.

D. Lead Hazards: Perform all Work that affects intact paint with any level of lead , at minimum, in accordance with the Cal/OSHA Lead in Construction Standard 8 CCR 1532.1 and other applicable Laws.

E. Work in this Agreement may include, but is not limited to, the following activities that may pose safety and health hazards to Principal Project Company:

1. Working around live, high voltage lines and wires, switches, moving vehicles and other potential hazards specific to a City yard, facility, or operating rail line.

2. Working around live utilities.

3. Entering or working in confined spaces.

4. Working around and inside shafts.

5. Working within an underground excavation and construction environment using mechanized equipment and structural temporary shoring support equipment.

6. Working within an underground tunnel environment using mechanized equipment.

7. Working with soils that may be hazardous or contaminated, or both.

8. Working around and in open trenches.

9. Working in spaces or areas where employees may be exposed to asbestos and lead.

10. Welding, painting, or other potentially hazardous Work, or working in the vicinity of such activities.

11. Working in a public right-of-way with vehicular traffic moving around or through the Project Site.

12. Working in rail right of way with light rail vehicles moving around and through the Project Site.

F. Protect the public from hazards including surface irregularities, un-ramped grade changes in pedestrian sidewalks or walkways, and trenches or excavation in roadways. Ensure safe routing of vehicular and pedestrian traffic around the Project Site, in compliance with American's with Disabilities Act (ADA) requirements.

1.3 SUBMITTALS

A. Principal Project Company shall submit to the City the following Submittals no later than ten Days before start of Work at the Project Site or NTP2, whichever is earlier. No construction Work shall start prior to City acceptance of the submittals listed below. Each Submittal listed below shall be a separate document and shall not combined within one another.

1. Site-specific Health and Safety Plan (HASP) prepared, signed and stamped by a Certified Industrial Hygienist (CIH).

2. Principal Project Company's Injury and Illness Prevention Programs (IIPP) and Code of Safe Practices (CSP), in accordance with the California Code of Regulations (CCR), Title 8.

3. Templates for all safety forms and reports:

   a. The Project Safety Representative's (PSR) daily inspection form shall accommodate twice daily inspections of their field work area(s) covering date, work area checked, employees present in the work area, PPE, work equipment being used in each area, workplace conditions, physical facility safety, and employee work practices. The form shall also accommodate any deficiencies and corrective actions.

   b. The Safety Meeting Attendance sheet of the "toolbox" safety meetings conducted per CAL/OSHA standards.

   c. Activity Hazard Analysis (AHA) or Job Hazard Analysis (JHA).

   d. Incident or Near-Miss Incident Investigation Reports.

   e. Corrective Actions Report.

   f. Project Site Visitor Policy Form

4. Completed Activity Hazard Analysis (AHA) or Job Hazard Analysis (JHA) submitted with the HASP using the AHA/JHA template for all significant activities and tasks with a high-risk potential, describing the job steps, hazards associated with each job step, and the controls used to remove or minimize the associated hazards

5. SDS (Safety Data Sheet) for all chemicals and other hazardous materials used in the Work.

6. If Serpentine is present Principal Project Company shall have Cal/OSHA 40-hour asbestos training for the competent person overseeing Serpentine/ Naturally Occurring Asbestos (NOA) disturbance activities and managing personal air monitoring for asbestos.

B. Experience Statement. Principal Project Company shall submit to the City no later than 10 days prior to the start of construction Work the qualifications and experience of the it's Project Safety Representative (PSR) as specified in this Section 01 35 45 – Health and Safety Criteria.

1. Documentation and Certification (current and valid) of the Project Safety Representative (PSR):

    a. The name of the designated Project Safety Representative (PSR).

    b. OSHA Certified 30-Hour Construction Training.

    c. The 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Training Program.

    d. First Aid/CPR certification/training within the past two years

    e. Cal/OSHA 40-hour asbestos training for the Competent Person overseeing NOA disturbance activities and managing personal air monitoring for asbestos.

    f. Documentation demonstrating a minimum of three (3) years recent experience in conducting and supervising safety and health programs on construction projects similar to the Work of this Contract.

C. Principal Project Company shall maintain the following throughout the course of construction and provide to the City immediately upon request.

1. Daily inspection reports (as per Part 1.7 of this Section) signed by the PSR documenting twice daily inspections of their field work area(s) covering date, time visited, work area checked, employees present in the work area, PPE, work equipment being used in each area, workplace conditions, physical facility safety, and employee work practices. Any deficiencies and corrective actions shall also be documented.

2. Records of topics and safety meeting attendance sheet of the “toolbox” safety meetings conducted per CAL/OSHA standards.

3. Incident or Near-Miss Incident Investigation Reports and Corrective Action Reports – Submitted to the City’s Authorized Representative within 24 hours of the Project Incident or Near-Miss Incident.

4. Final Incident or Near-Miss Incident Investigation Reports and Final Corrective Action Reports – Submitted to the City’s Authorized Representative within 48 hours of the Project Incident or Near-Miss Incident.

5. HASP modification requests, and approved modifications to the appended HASP – Submitted to the City for review (if applicable).

6. Respiratory Protection Program, records and documentation (if applicable to the Work).

7. Hot Work permit (if applicable to the Work).

8. IIPP and CSP modification requests and approved modifications to the appended IIPP and CSP.

9. OSHA’s Form 300A “Summary of Work-Related Injuries and Illnesses” annual form. (Principal Project Company shall submit the Form 300A each year and whenever it is updated).

D. Upon receiving a written request from the City, Principal Project Company shall submit to the City any document relating to health and safety within five (5) Days from the date of such request.

1.4 REFERENCES

Work performed shall be consistent with the following guidelines and references and in compliance with all applicable regulations and standards, including those listed below. In the case that these requirements are conflicting, the one which offers the greatest level of safety shall be followed.

A. California Code of Regulations (CCR), Title 8

   1. Industrials Relations

   2. Construction Safety Orders

   3. General Industry Safety Orders

B. Cal/OSHA Occupational Safety and Health Administration (OSHA) Regulations.

   1. CCR Title 8 Standards (All)

   2. CCR Title 8 Tunnel Safety Orders (8403-8552)

C. National Institute for Occupational Safety and Health (NIOSH) Publications.

D. U.S. Environmental Protection Agency (USEPA) Publications.

E. American Conference of Governmental Industrial Hygienists (ACGIH) Publications.

F. Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.).

G. Code of Federal Regulations (CFR), Title 29 – Labor.

H. Federal Railroad Administration Roadway Protection Rule (49 CFR Part 214C).

I. State of California, Health and Safety Code.

J. California Department of Industrial Relations, DOSH Mining and Tunneling Unit, Underground Classification dated March 16, 2009.

K. State of California, Public Utilities Commission, General Order No. 95, “Rules for Electric Line Construction”.

L. State of California, Public Utilities Commission, General Order No. 128, “Construction of Underground Electric Supply and Communication System”.

M. State of California, Public Utilities Commission, General Order No. 172, “Rules and Regulations Governing the Use of Personal Electronic Devices by Employees of Rail Transit Agencies and Fixed Guideway Systems”.

N. State of California, Public Utilities Commission, General Order No. 175-A, “Rules and Regulations Governing Roadway Worker Protection Provided by Rail Transit Agencies and Fixed Guideway Systems”.

O. Bay Area Air Quality Management District (BAAQMD) Regulations.

P. California Air Quality Board (CARB) Regulations.

Q. San Francisco Health Code.

1.5 HEALTH AND SAFETY PLAN (HASP)

A. Principal Project Company shall submit a Site-specific Health and Safety Plan (HASP) in accordance with this Specification, CFR Title 29, CCR Title 8 and other applicable regulations, which shall cover all aspects and scope of Work. The HASP shall remain in effect for the term of this Agreement and a copy of the HASP must always be on-Site.

B. Principal Project Company's Site-specific HASP shall set forth the policies and procedures to be followed by all Principal Project Company personnel at the Site. The HASP shall describe the safety requirements for the Work, and the means and methods by which Principal Project Company will implement and enforce those safety requirements. The HASP shall describe, in detail, the protocols necessary for the identification, evaluation, mitigation and control of all hazards associated with the Work and each task performed by Principal Project Company and all Principal Project Companys. The HASP shall identify Principal Project Company' Project Safety Representative (PSR) responsible for Project Site safety and enforcing safe practices in performing the Work. Principal Project Company's site-specific HASP shall describe the responsibility for employee and public safety of Principal Project Company's representatives who control each phase of the operations and shall set forth in writing the policies and procedures to be followed by all Principal Project Company personnel. Principal Project Company HASP shall establish, in detail, the protocols necessary for the recognition, evaluation, and control of all hazards associated with each task performed by Principal Project Company and lower tier Principal Project Companys.

C. The HASP shall be prepared, signed, and stamped by a Certified Industrial Hygienist (CIH). The HASP shall also be reviewed and signed by the Project Safety Representative (PSR), whose review shall be limited to general scope and completeness. Principal Project Company shall always be solely and entirely responsible for the safety of the Project Site and its personnel, Principal Project Company's personnel, persons working at or visiting the Project Site (including City representatives, employees and consultants), and persons passing through the Construction Area. Principal Project Company shall be solely responsible for the content, implementation and enforcement of its HASP. Principal Project Company shall not perform any Work at the Project Site until the HASP has been submitted to and accepted by the City.

D. The City will not review the HASP for its content, nor will the City be liable for Principal Project Company's failure to have an adequate HASP or implement it. Submission to and receipt of the HASP to the City and regulatory agencies neither constitutes to the legality of the HASP nor does it incur liability. Submission, acceptance, and receipt of the HASP to the City, or any review of the HASP by the City, shall not be construed as approval of the adequacy of Principal Project Company's PSR, Principal Project Company's HASP or any safety measures taken in or near the construction site.

E. Any changes or modifications to Principal Project Company's HASP must be signed by Principal Project Company's PSR and submitted to the City. The modification shall be appended to Principal Project Company HASP. All personnel working on the Project Site shall be fully informed of the modifications of the HASP and any required actions arising from those HASP modifications before performing any of the Work that mat be impacted by those modifications.

F. The HASP shall be divided into two parts. Part One shall address the Environmental Health aspect of safety. Part Two shall address Construction Safety.

G. Part One of HASP - Environmental Health:

1. Identification and description of the responsibility of those individuals who control each phase of operations and are responsible for employee and public safety. The HASP shall set forth in writing the policies and procedures to be followed by all personnel. The HASP shall include the designation and resume of an overall Project Safety Representative (also referenced as health/safety officer). The PSR shall have full authority to correct any

unsafe conditions at the Project Site or unsafe means or methods of performing the Work. The PSR shall have the authority to stop any construction activity or modify Work practices, means or methods that do not accord with the HASP or that are necessary to protect workers, property, and the surrounding community. This requirement shall apply throughout the term of this Agreement and is not limited to working hours.

2. Hazard Communication Plan: Information identifying and delineating all workplace hazards that has been identified or is generally associated with the proposed Work phases and how this information is communicated to employees (e.g., tailgate/toolbox safety meetings, monthly safety meetings, and daily job briefings). Hazardous material communication standards can be found in 29 CFR 1910.120 & 8 CCR 5194. Hazardous waste information can be found in 29 CFR 1910.1200 & 8 CCR 5192. Local hazardous material/waste information can be found in Articles 21, 21A, 22 and 22A of the San Francisco Health Code.

3. Mitigation measures to identify, monitor, and control worker and general public exposure to any identified hazard. Principal Project Company shall determine the need to conduct and monitor its personnel for contaminant exposure to maintain the proper level of personal protection, including the action level.

4. Personnel: Provision of enough personnel properly trained to handle, remove, excavate and dispose of hazardous waste and contaminated waste that may be encountered or generated by the Work. The HASP shall specify the general training required for all Principal Project Company personnel, and any specialized training required for personnel identified to manage and/or handle hazardous materials, including but not limited to:

    a. Asbestos training that meets the Cal/OSHA Work Activity Level for naturally occurring asbestos (NOA) as per the Cal/OSHA Construction Asbestos Standard, 8 CCR 1529, all applicable Sections and Section 1529.

    b. Lead, petroleum hydrocarbons, volatile and semi-volatile organic compounds (VOC's and SVOC's) awareness training.

    c. The 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Training Program.

    d. It's associated 8-hour refresher training in accordance with 29 CFR 1910.120, and 8 CCR 5192.

    e. Respiratory program in accordance with 29 CFR 1910.134 and 8 CCR 5144.

    f. Respirable Crystalline Silica OSHA Regulation in accordance with 29 CFR 1926.1153

    g. Other Site-specific or Project specific hazards requiring safety training.

5. This training shall be required for all Principal Project Company and Principal Project Company personnel who will encounter or operate equipment that handles contaminated materials. The HASP shall include records establishing the subject matter, dates, tines, and attendees of all safety trainings. Principal Project Company shall maintain training records as required by Cal-OSHA and applicable regulations.

6. NOTE: Cal/OSHA regulations are triggered when asbestos is present in any amount. Principal Project Company shall meet its obligations under CCR Title 8, Section 1529. The regulation requires monitoring to determine exposure levels, wet methods, respirators and protective clothing, controlled access to the work area, and similar precautions associated with asbestos work regardless of the origin of the asbestos. Use

of a competent person to oversee the work may also be necessary. Principal Project Company shall utilize an experienced Certified Industrial Hygienist (CIH) and a Professional Geologist (PG) to assist it with this work.

7. Requirements of Principal Project Company and Principal Project Companys for implementing the following:

    a. Medical surveillance programs. Principal Project Company is responsible for providing medical examinations and maintaining medical records of personnel.

    b. Code of Safe Practices and Injury and Illness Prevention Programs (IIPP), i.e., SB 198, 8 CCR and CAL/OSHA, GISO 3203, Section 5192 and 1509.

    c. Personnel air monitoring according to 29 CFR and 8 CCR.

    d. The Construction Standard (29 CFR 1926).

    e. Federal and California Lead Standards for the Construction Industry (29 CFR, Part 1926.62 and 8 CCR, Section 1532.1, respectively)

    f. Asbestos OSHA Regulation 29 CFR Part 1926.1101 & 8 CCR 1529.

    g. Workers' Right to Know (29 CFR 1910.120).

    h. Section 6360-99 of the California Labor Code (Hazard Communication).

    i. The American with Disabilities Act (ADA).

8. Engineering controls, specific Work practices, air monitoring for contaminants (e.g., dust, natural occurring asbestos (NOA), serpentine, lead, volatile organic, and hydrocarbons), and personal protective equipment (8 CCR 5144) to protect Principal Project Company personnel, City personnel on the Site, and the public impacted by the Work.

9. Methods to be used to decontaminate equipment and personnel.

10. Sanitation facilities to be provided for personal hygiene. Portable toilets and discharge of their waste products into sanitary sewers shall comply with local codes.

11. Contingency /Emergency Response Plan procedures for emergencies including fire, spillage of hazardous/toxic wastes and liquids (with special emphasis to clean up of spillage due to fuel/oil from Principal Project Company's equipment), traffic accident, personal accident, power failure, or any event that may require modification or abridgment of site control and decontamination procedures.

    Part Two of HASP—Construction Safety:

12. Principal Project Company shall include an organizational structure in the HASP that sets forth lines of authority, responsibility, and communication, including a description of Principal Project Company’s organization and Project responsibilities of key personnel.

13. Principal Project Company shall inform its employees, supervisory personnel and visitors (invitees) to the Project Site of known Project Site hazards.

14. Principal Project Company shall take necessary precautions and implement mitigation measures to prevent or reduce the release of pollutants in the form of dust, fume, mists, excessive noise and vibration into the air and surrounding environments.

15. Principal Project Company shall ensure at least one individual on each job site always has current CPR/First Aid/AED training.

16. Principal Project Company shall employ a Project-specific hard hat insignia (sticker) program which identifies workers that have successfully completed the Project safety training.

17. Information identifying and delineating all workplace safety hazards and how this information is communicated to employees (e.g., tailgate/toolbox safety meetings, monthly safety meetings, daily job briefing).

18. Principal Project Company shall at all time be responsible for providing its employees and visitors with the proper level of personal protective equipment (PPE), that shall be appropriate to the type of work being performed by the individual employee. At a minimum, Principal Project Company, Principal Project Company's personnel and visitor shall wear hardhats, ANSI class 2 vests, and safety glasses with side shields at the work site. Hardhats shall show company name.

19. Safety Action Measures: For Work requiring Cal/OSHA permits, special training and/or use of designated competent persons to oversee the Work, Principal Project Company shall prepare Safety Action Measures, to address these Work activities. The Safety Action Measures shall include detail information needed to perform the activity safely, verify that the persons involved in the Work are properly trained or certified, the equipment used is inspected and suitable for the Work, the proper permits have been obtained.

20. The format for all safety forms and reports shall be developed by Principal Project Company and submitted as part of Principal Project Company HASP.

21. Periodic safety performance reviews and procedures on safety inspections. A sample daily inspection form shall be provided in Principal Project Company's HASP and shall include date, Work area checked, employees present in the Work area, PPE, Work equipment being used in each area, safety and health issues, notes.

22. Procedures in handling non-compliance/violations of safety requirements, e.g. deficiency correction reports, stop Work orders, disciplinary actions, etc.

23. Communication and reporting requirements, including the immediate reporting of injury accidents and submittal of corrective action reports.

24. Requirements concerning, distribution, and maintenance of personal protective equipment and safety tools.

25. Measures and procedures to be used to report, monitor and control exposure of Principal Project Company personnel and public to any identified safety hazards. Principal Project Company shall monitor Site personnel for contaminant exposure and ensure appropriate PPE is used.

26. Provision for all personnel to be properly and regularly trained in construction safety and emergency response. The level of training required for all or specified Principal Project Company or Principal Project Company personnel, including, but not limited to the following:

    a. Heat stress

    b. Fire prevention and protection plan

    c. Fall protection and prevention program

d. Confined Space Entry

e. Special Equipment

f. Ergonomics

g. Contingency Plan for emergency including fire, earthquake, etc.

27. Site Access Control Plan covering Principal Project Company and City personnel, consultants, representatives, the public, and Project Site visitors (see relevant subparagraph 1.14 CONSTRUCTION SITE VISITORS).

28. Construction site visitor guidelines, including the site-specific orientation and Project Site Visitor Policy form (see relevant subparagraph 1.14 CONSTRUCTION SITE VISITORS).

29. Principal Project Company's alcohol and substance abuse program shall describe the measures that Principal Project Company will implement to ensure that all Principal Project Company personnel working on the Project comply with the drug and alcohol restrictions stated in this Agreement and in Principal Project Company's Corporate Policy and Program. Principal Project Company's and Principal Project Company's personnel shall not use any alcohol or controlled substance when performing the Work, and Principal Project Company shall not allow any person on the Project Site who is under the influence of any alcohol or controlled substance, including any prescription the negatively affects alertness or performance.

30. Completed Activity Hazard Analysis (AHA) or Job Hazard Analysis (JHA) submitted with the HASP using the AHA/JsHA template for all significant activities and tasks with a high-risk potential, describing the job steps, hazards associated with each job step, and the controls used to remove or minimize the associated hazards.

31. Activity Hazard Analysis (AHA): https://www.navfac.navy.mil/content/dam/navfac/NAVFAC%20Atlantic/NAVFAC%20Southeast/PDFs/Safety/se_sf_activity_hw_trn.pdf

32. Job Hazard Analysis (JHA) Form: https://www.osha.gov/Publications/osha3071.pdf

H. Furnish copies of all records of all health and safety audits, inspections, and reviews to the City's Authorized Representative

I. The City reserves the right to require that Principal Project Company modify the HASP to address Project Site safety issues. However, the City's action or lack thereof on the HASP shall not be construed to mean approval, or acceptance of Principal Project Company's responsibility for compliance with the applicable laws and regulations.

1.6 INJURY AND ILLNES PREVENTION PROGRAM (IIPP) AND CODE OF SAFE PRACTICES (CSP)

A. Principal Project Company shall submit an Injury and Illness Prevention Programs (IIPP) and Code of Safe Practices (CSP) in accordance with this specification, CCR Title 8 and other applicable regulations. A copy of all applicable IIPP and CSPs must always be on-Site.

B. The City will not review IIPPs or CSPs for their content, nor will the City be liable for Principal Project Company's failure to have adequate IIPPs/CSPs or implement them. Submission to and receipt of IIPPs/CSPs to the City and regulatory agencies neither constitutes to the legality of the IIPPs/CSPs nor does it incur liability. Submission and receipt of IIPPs/CSPs to the City, or any review of the IIPPs/CSPs by the City, shall not be construed as approval of Principal Project Company's IIPPs/CSPs or any safety measures taken in or near the construction site.

C. Any changes or modifications to Principal Project Company's IIPP/CSP must be submitted to the City. The modification shall be appended to the appropriate IIPP/CSP. All on-site personnel shall be fully informed of the modifications, changes, and required actions prior to conducting any additional work activities.

1.7 REQUIREMENTS OF THE PROJECT SAFETY REPRESENTATIVE

A. Principal Project Company shall designate in writing a responsible competent person at the Project Site as Project Safety Representative (PSR) whose principal duties shall be the prevention of accidents and the maintenance and supervision of safety precautions and programs in accordance with the requirements of applicable laws and regulations. The PSR is also a qualified person having the necessary training to be knowledgeable in the identification, control, and management of the hazardous materials encountered onsite.

B. Principal Project Company's Project Safety Representative (PSR) shall:

1. Be readily available (within 30 minutes of City request) to consult with the City at the site during all Project working hours and shall be available 24 hours a day, 7 days a week by telephone or other approved means. The PSR shall meet with the City at least once per week.

2. Have completed a 30-hour OSHA Certified Construction Safety training session and must submit documentation of such training to the City.

3. Have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Training Program

4. If more than one Project site working shift is initiated, Principal Project Company shall ensure that provisions are made to have a qualified PSR to cover all Work shifts

5. Be knowledgeable with the safety provisions of Federal OSHA, Cal/OSHA and the requirements of this section.

6. Be currently certified in First Aid/CPR and be able to use an automatic external defibrillator (AED).

7. Possess qualifications, which include a minimum of three (3) years recent experience in conducting and supervising safety and health programs on construction projects like this Contract.

8. Be capable of performing safety inspections and accident investigations.

9. Perform twice daily inspections of their active field Work area(s) covering workplace conditions, physical facility safety, and employee Work practices. Any deficiencies and corrective actions shall be documented. Furnishing of daily inspection reports shall be done as incidental work. The PSR shall meet on-site with the City at least once per week.

10. Administer and enforce the site-specific Health and Safety Plan, Injury and Illness Prevention Plan (IIPP), and Code of Safe Practices (CSP).

11. Administer and enforce the visitor site-specific safety orientation, the Project Site Visitor Policy and its guidelines.

12. Advise Principal Project Companys, vendors, and visitors to the job site of potential hazards and the requirements of Health and Safety practices and rules.

13. Coordinate Principal Project Company's Work regarding hazardous material procedures and controls (as required).

14. Establish and maintain restricted Work Areas.

15. Enforce proper use of personal protective equipment.

16. Communicate approved modified safety requirements to Project Site personnel as well as visitors to the site.

17. Notify to and coordinate with the City for the immediate assessment and remediation Work for unforeseen hazardous materials conditions discovered in the course of the Work.

18. Have "Stop Work Authority" – the ability to stop Work without any adverse consequences when unsafe conditions are present.

1.8 REQUIREMENTS OF THE ASBESTOS COMPETENT PERSON

A. Principal Project Company shall designate in writing a responsible asbestos Competent Person (ACP) at the Project Site whose principal duties shall be overseeing asbestos soil disturbing activities, implementing engineering and administrative controls to prevent asbestos from becoming airborne, and general compliance with Cal/OSHA, CARB, and EPA regulations related to asbestos and naturally occurring asbestos (NOA) when impacted as part of the Project. The ACP is also a qualified person having the necessary training and experience to be knowledgeable in the identification, control, and management of asbestos and naturally occurring asbestos encountered onsite. The PSR and ACP may be the same person if all training and experience requirements for both positions are met.

B. Principal Project Company's Asbestos Competent Person (ACP) shall:

1. Communicate all NOA-related issues to the PSR daily and as needed as required for the PSR to fully execute its duties.

2. Have completed 40-hour Cal/OSHA-required asbestos Principal Project Company supervisor training and must submit documentation of such training to the City.

3. Possess qualifications, which include a minimum of three (3) years recent experience as an ACP on construction projects similar to this Contract.

4. Implement the elements of Cal/OSHA asbestos in construction standard 8 CCR §1529 and other applicable regulations and standards, including but not limited to:

    a. Demarcate the Regulated Areas and control the points of ingress and egress,

    b. Conduct asbestos worker training to all workers in Cal/OSHA Regulated Areas, and NOA awareness training to all workers and visitors who enter the site and are outside of the Regulated Areas,

    c. Assure that wet methods and other engineering controls are implemented to minimize asbestos emissions,

    d. Conduct the Initial Exposure Assessment and select respiratory protection accordingly, as required,

    e. Conduct daily personal monitoring and communicate exposure results to workers,

f. Based on monitoring results, continuously re-evaluate PPE requirements select the appropriate respiratory protection to prevent exposure above the PEL,

g. Assure that personal decontamination stations are adequate and located to allow workers to decontaminate thoroughly prior to exiting the Regulated Areas. The decontaminate stations shall include water and boot scrubs, HEPA-vacuums, cleaning wipes for respirators, and facilities to dispose of used Tyvek.

5. Perform twice daily inspections of asbestos and NOA field work area(s) for compliance with all asbestos and NOA regulations and standards. Any deficiencies and corrective actions shall be documented.

6. Have “Stop Work Authority” – the ability to stop work without any adverse consequences when unsafe conditions are present.

1.9 TRENCHING AND SHORING

A. Trench Safety: Principal Project Company shall comply with all shoring and excavation requirements set out in Federal OSHA (29 CFR 1926.650-652), Cal/OSHA (Construction Safety Order 1539-1544), the California Labor Code, and the Contract Documents.

B. Federal and State Safety regulations requires

1. Safe Exits: A stairway, ladder, ramp or other safe means of egress shall be in trench excavations that are 4 feet or more in depth to require no more than 25 feet of lateral travel for employees.

2. Shoring is required for trenches at 5 feet depth or greater, and must be designed to prevent cave-ins. Shoring may be required for trenches less than 5 feet in depth unless excavations are made entirely in stable rock or examination of the ground by a competent person provides no indication of a potential cave-in.

3. Keep excavated materials at least 2 feet or greater from the side of the excavation.

1.10 CONFINED SPACE ENTRY

A. Principal Project Company shall provide all equipment and assistance to make the confined space safe for entry by Principal Project Company's personnel, the City representatives, and its consultants in accordance with the California Code of Regulations, Title 8, General Industry Safety Orders, "Confined Spaces."

B. If any activities associated with confined space entry become necessary, Principal Project Company shall be required to consult the City for guidance and prepare an appropriate Permit-Required Confined Space Entry Plan.

1.11 ELECTRICAL LOCKOUT/TAGOUT PROCEDURES

A. Training of Principal Project Company's employees in procedures for locking out and tagging out of electrical equipment that must be de-energized to accommodate the Work.

1. The lockout/tag out of electrical energy sources shall occur at the circuit disconnect switch in all cases.

2. Principal Project Company shall furnish locks used for this purpose.

3. Principal Project Company shall furnish tags, locks, and lock box(s) that are compatible with electrical distribution equipment to be de-energized.

B. Principal Project Company shall attach white "DANGER" tags to locked switches to indicate that the circuit must not be energized.

C. Red "DANGER" tags shall be used to indicate that Principal Project Company personnel are actively working on equipment or lines connected to the locked switch. If the task that requires locking the switch has not been completed at the end of a shift or workday, Principal Project Company shall leave the switch lock in place, remove its Red Tag, but leave the White Tag in place on the locked circuit. When Principal Project Company resumes that Work, Principal Project Company shall again attach a Red Danger tag to the locked switch

1.12 CONSTRUCTION EQUIPMENT AND TOOLS

A. Principal Project Company shall only use construction equipment and tools designed and intended by the manufacturer for the Work. All Principal Project Company equipment shall conform to Cal/OSHA requirements.

B. Principal Project Company shall not use and remove from the Project Site at its expenses any equipment that the City as Regulator determines is unsafe, not intended for the Work, or that does not meet Cal-OSHA requirements.

1.13 PERSONAL PROTECTIVE EQUIPMENT (PPE)

A. Principal Project Company shall define task-specific PPE requirements for all personnel and visitors in compliance with applicable laws, rules, and regulations. PPE shall always be worn on the Site, including travel within the Project Site when starting or ending shifts. Minimum requirements include:

1. Hard hats are always required at the Site. Hardhats shall show company name.

2. Appropriate eye and face protection that complies with ANSI Z87 shall always be worn.

3. Safety glasses with side shields are required at the Site.

4. Sensible and safe Work clothing and closed-toe shoes must be worn at the Site.

5. No canvas/leather sneakers or sandals may be worn in the project work areas.

6. Appropriate hearing protection shall be worn at the Project Site where sound levels exceed Cal/OSHA standards.

7. Suitable gloves must be worn to protect the hands from injury as required by Cal/OSHA.

8. High visibility warning vests (ANSI class 2 vests) or other suitable garments marked with or made of reflection or high-visibility material must always be worn at the Site.

9. Within a Cal/OSHA asbestos Regulated Areas, suitable protective clothing and respiratory protection in accordance with 8 CCR § 1529 as prescribed by the Asbestos Competent Person (ACP).

B. Principal Project Company's PSR and/or ACP shall establish additional appropriate levels of protection for each Work task in accordance with Cal/OSHA standards.

C. If respiratory protection is utilized, Principal Project Company shall implement a Respiratory Protection Program in accordance with Cal/OSHA requirements. Principal Project Company will also provide the following to the City prior to beginning any portion of Work that requires respiratory protections:

1. Copies of the Respiratory Program

2. Respirator training records

3. Fit-testing and medical approval documentation

4. Annual documentation for training, fit testing and medical evaluations

D. Principal Project Company shall provide appropriate respiratory equipment to its personnel and visitors. Principal Project Company shall inspect and maintain equipment in accordance with Cal-OSHA regulations.

E. Where “Hot Work” is involved, a Hot Work permit must be submitted to the City as Regulator prior to commencing that Work. Personnel performing Hot Work must wear clothing that provides thermal protection. Principal Project Company shall erect welding screens where welding operations may expose its personnel or the public to welding sparks, light and other hazards.

F. Safety harnesses must be worn by personnel in manlifts and when working at heights, in accordance with OSHA requirements in manlifts.

G. Workers must wear a safety harness with their safety lanyard secured to a separate lifeline while working from swing scaffolds, boatswain’s chairs, or other suspended Work platforms that present a fall hazard.

1.14 PROJECT SITE VISITORS

A. All Project Site visitors upon arrival must check in with Principal Project Company’s Project Safety Representative (PSR). Visitors are defined as persons who are not assigned as direct staff or employees of Principal Project Company. The PSR will coordinate a site-specific safety orientation prior to jobsite entry. The site-specific safety orientation shall provide visitors with a review and understanding of safe jobsite procedures and practices, including any safety trainings if required. Principal Project Company’s site-specific safety orientation, at a minimum, shall include discussion of:

1. Required personal protective equipment (PPE)

2. Site access/egress routes (Site Access Control Plan)

3. Emergency contacts and procedures

4. First-aid locations

5. Potential known hazards

6. Required safety trainings and procedures

7. Construction site operations and conditions

B. Following the site-specific safety orientation, visitors must complete and sign a construction site visitor policy form provided by Principal Project Company. Failure to acknowledge and agree to all requirements of the construction site visitor policy form shall result in denied access to the construction work zone. The visitor policy form, at a minimum, shall require visitors to accept and acknowledge that they:

1. Have received and understand the site-specific safety orientation

2. Must not handle or utilize any job equipment, tools, or materials at any time

3. Must always wear proper PPE (Principal Project Company is responsible for providing any missing PPE to visitors)

4. Must attend any required safety trainings

5. Must observe and comply with construction signage, barricades, and operations

C. All visitors re-visiting jobsites shall be identified with a visitor sticker provided by Principal Project Company. Principal Project Company shall be responsible for providing and maintaining legible stickers. Visitor stickers shall indicate the visitor's name, the date of the site-specific safety orientation, and the project number. Principal Project Company's PSR is responsible for determining if any additional re-training is required to account for changing site conditions and procedures.

D. The City and Principal Project Company shall reserve the right to remove any visitor from the jobsite at any time, if he or she feels that the visitor is failing to adhere with the on-site safety requirements. Areas open to public access (e.g. sidewalks/designated paths of travel) are exempt from the Project Site Visitor Policy.

1.15 EMERGENCY EQUIPMENT

A. Principal Project Company shall provide emergency and first aid equipment required by Cal-OSHA and other applicable regulations and necessary for the Project. The following items, at a minimum, shall be maintained at the Project Site and available for immediate use:

1. First aid equipment and supplies, including first aid kits and eyewash station per Cal/OSHA standards

2. Spill control materials and equipment, including multi-purpose absorbent materials, poly bags, brooms and shovels and drums (if applicable)

3. Fire extinguishers with a minimum rating of 2A-10B:C and as required by Cal/OSHA standards for scope of Work requirements

4. Emergency rescue equipment including SCBA and tripod/extraction equipment for confined space rescue; backboard/basket for transport of injured personnel, air horns/bull horns for emergency signaling and communications (as applicable to the Work).

5. All Principal Project Company's boats and vessels used on the project shall comply with the U.S. Coast Guard and Cal/OSHA and all applicable regulations for working in/around water and waterways.

1.16 HAZARDOUS MATERIALS ENCOUNTERED AT THE SITE

A. Proposition 66 Warning: Many of the materials and items at the Project Site contain materials known to the State of California to be either carcinogenic, reproductive toxins, or that may be otherwise toxic or hazardous.

B. Principal Project Company shall ensure that all personnel, including Principal Project Companys' personnel, receive appropriate training and orientation concerning toxic and hazardous materials that will prevent inadvertent or unauthorized disturbance of hazardous materials present at the Site.

C. Principal Project Company shall comply with all applicable requirements of the California Code of Regulations, Title 8, Section 1532.1, "Lead in Construction".

D. Principal Project Company shall take necessary precautions to prevent the release of lead and/or asbestos in the form of dust, fumes or mists from lead-containing and asbestos-containing materials into the air or into surrounding environments.

E. Principal Project Company shall inform all workers, supervisory personnel and authorized visitors to the Project Site of the potential hazards of lead and asbestos and of necessary precautions and housekeeping procedures to reduce the potential for exposure in areas where lead or asbestos is known to be present.

1.17 HAZARDOUS MATERIALS THAT MAY BE INCORPORATED INTO THE WORK

A. Principal Project Company shall maintain copies of Safety Data Sheets (SDS) for all substances used at the Project Site or incorporated into the Work.

B. Principal Project Company shall be responsible for coordinating the exchange of SDS or other hazard communication information that is required to be made available at the site.

C. Principal Project Company shall notify the City if a specified product or piece of equipment, or the intended use of such product or equipment is unsafe, prior to ordering such items or incorporating such items into the Work.

D. Principal Project Company shall be responsible for complying with all BAAQMD regulations regarding the use, documentation and notification procedures related to asbestos-related construction Work, use of aerosol products and products that are with the limits for Volatile Organic Compounds (VOC's) and other limits for compounds regulated by BAAQMD.

1.18 MEETINGS

A. Principal Project Company shall conduct regular trainings for its personnel, including but not limited to "toolbox/tailgate" safety meetings, in accordance with Cal/OSHA requirements. Principal Project Company shall document the date, time, subject addresses, and names of persons who attended any training meetings using the Safety Meeting Attendance sheet, which Principal Project Company shall keep on file.

B. Principal Project Company's Project Manager, Superintendent(s), and PSR shall attend Weekly Project Coordination Meetings (as required) to review the project's Immediately Dangerous to Life and Health (IDLH) actives, stop Work activities, incidents, and incident investigations.

1.19 LOGS, REPORTS, AND RECORDKEEPING

A. Principal Project Company shall maintain Project safety audits, employee training records and certifications, equipment safety inspection logs, incident reports, visitor logs and all reports covering the implementation of Principal Project Company HASP at the Project Site for review upon request by the City.

B. Principal Project Company shall submit Monthly project safety statistics, which shall include Project safety inspections, hours worked by Principal Project Company, OSHA Recordable Incidents, Incident Rates, Lost Work Day Cases, Total Project Lost Work Days, Days Away from Work Rate, First Aid Cases, and Property Damage Incidents, to City as part of the Monthly Progress Status Report.

C. Principal Project Company shall provide the City access to the Project Site, and to all logs and records concerning the Work. The City's review of Principal Project Company's logs and records documenting its safety performance shall not be construed as approval or waiver of the adequacy of any safety measures taken in, on, or near the Project Site. The City's review of Principal Project Company's logs and records shall not relieve Principal Project Company of its responsibilities of performing and enforcing health and safety inspections/audits, monitoring, or any other components of the Project safety requirements or Principal Project Company's HASP,

and any liability that may arise from Principal Project Company's performance or failure to perform safety Work.

1.20 REMEDIAL ACTION

A. The City will issue a notice of non-compliance if City personnel observe any condition at the Project Site that poses an immediate and serious risk to the life or health of persons at the Site, or if City personnel observe that Principal Project Company has failed to timely correct violations of health or safety standards. The notice will document the facts and circumstances of non-compliance and will require Principal Project Company to immediately remedy and correct the non-compliance and confirm in writing within 24 hours of receipt of the notice that the non-compliant conditions described in the notice have been corrected.

B. If Principal Project Company repeatedly fails to comply with applicable health and safety laws, rules, regulations, and orders, the City reserves the authority to have the necessary Work performed by others and deduct corresponding costs from Principal Project Company's progress payment(s); suspend progress payments; or terminate the contract for cause.

C. Principal Project Company's non-compliance with applicable health and safety laws, rules, regulations, orders, and contract safety requirements may be deemed breach of contract, for which the City may suspend the Work, and dismiss from the Work any employee of Principal Project Company, Principal Project Company, or Supplier responsible for the non-compliance, as provided in the General Provisions. Principal Project Company shall bear all costs arising from such suspension of Work or dismissal of employee(s).

D. Principal Project Company shall not create any condition that endangers the safety of any person on the Project Site, including City employees, Principal Project Company employees, City consultants, and the public. If City personnel observe such a condition, the City is authorized to suspend the Work until the condition is corrected. Such order to suspend the Work shall not impose on the City any obligation, penalty, additional costs or assumption of liability of any kind. Contract Time shall not be extended by such suspension, and Principal Project Company shall be solely responsible for and the City shall not compensate Principal Project Company for any delay caused by a suspension of the Work due to unsafe conditions. Any suspension of Work due to unsafe conditions shall not relieve Principal Project Company of its control of the Project Site or responsibility for safety on the Project Site during the period the Work is suspended.

1.21 INCIDENT REPORTING AND INVESTIGATION

A. Principal Project Company personnel who are involved in or witness an unsafe condition at the Project Site or a Reportable Incident (as defined by Cal-OSHA) shall immediately report the condition or incident to Principal Project Company's Project Site supervisor or foreman, who in turn shall immediately notify the City's Authorized Representative.

B. Principal Project Company personnel who are involved in or witness a near-miss incident must report it to the responsible Project Site supervisor or foreman within a reasonable time frame, not to exceed 24 hours, who in turn shall immediately notify the City's Authorized Representative.

C. Principal Project Company shall allow City to participate and review all Project incident or near-miss investigations.

D. Principal Project Company's foremen, superintendents, and managers shall not decline to accept or relay a report of injury or significant near-miss incident from any person.

E. All incidents and significant near-miss incidents shall be investigated immediately by Principal Project Company's designated Project Safety Representative (PSR).

F. For all incidents and near miss incidents (“near miss”), Principal Project Company shall submit to the City a Preliminary Incident/Near Miss Investigation Report (PIR) within 24 hours of the incident or near miss. Principal Project Company shall submit a Final Incident/Near Miss Investigation Report (FIR) as soon as possible (generally within 48 hours) after incident or near miss. Principal Project Company shall not perform Work in the area or of a type that poses risks similar to those of the incident or near miss until a Corrective Action Report (CAR) is complete and submitted to the City.

G. The PIR and the FIR shall include at a minimum the following:

1. What happened? Include interviews with injured workers and witnesses as well as examination of the workplace for factors associated with the incident or near miss.

2. Why did the incident or near miss happen? idIentify the root causes of the incident or near miss. Root causes are the underlying or systemic, rather than the generalized or immediate, causes of an incident/near miss. To identify root causes, the investigation must obtain all the facts surrounding the occurrence and then ask why. For example, what caused the situation to occur; who was involved; was/were the employee(s) qualified to perform the functions involved in the incident or near miss; were they properly trained; were proper operating procedures established for the task involved; were procedures followed, and if not, why not; where else this or a similar situation might exist, and how it can be corrected.

3. What should be done? The investigation must determine all corrective actions required to eliminate the cause(s) of the incident or near miss.

4. What action has been taken and what remains to be taken? Document actions already taken to reduce or eliminate the exposures being investigated. Document all interim or temporary precautions. Document any pending corrective action and reason for delaying its implementation.

5. Principal Project Company shall submit to the City a Corrective Action Report (CAR) that documents that all corrective actions have been completed and fully implemented and all job site hazards and behaviors that caused the incident or near-miss incident have been corrected. The CAR shall include certification signed by an authorized Officer of Principal Project Company as to the completeness and accuracy of the FIR and the CAR.

1.22 ACCIDENT DOCUMENTATION AND REPORTING

A. If an accident causes death, serious injury, or serious property damage, Principal Project Company shall immediately report the accident to the City’s Authorized Representative by telephone, text message or email and to appropriate authorities (for example, Cal-OSHA).

B. In addition, Principal Project Company shall promptly report in writing to the City all accidents or near-miss incidents whatsoever arising out of or in connection with, the performance of the Work whether on occurring on or adjacent to the Project Site or the Construction Area. Principal Project Company shall give full details of the facts and circumstances of the cause and nature of the incident including statements of witnesses.

C. Principal Project Company shall make positive contact with City Authorized Representative. Voicemail does not constitute “positive contact.” Principal Project Company shall escalate from Project Manager to Project Director until positive contact is made immediately following an incident.

D. Principal Project Company shall provide to the City within five working days of an incident or accident or near-miss incident or accident, a written incident or accident; or near-miss incident or a near-miss accident report. A significant accident is defined to include events where

personal injury is sustained, or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury.

E. If any person lodges a claim against Principal Project Company or any Principal Project Company alleging injury or property damage arising from the Work, Principal Project Company shall promptly report the claim and all relevant facts concerning the claim in writing to the City.

F. Principal Project Company is responsible for all documentation and reporting obligations of any accident and near-miss incidents in accordance with as per federal, State and local laws and regulations.

1.23 CITY SAFETY REPRESENTATIVE

A. The City may at any time and without notice enter the Project Site and inspect the Project Site and the Work, observe Principal Project Company's means and methods of performing the Work and maintenance of the Project Site, and review Principal Project Company's compliance with applicable safety requirements, regulations and laws, including but not limited to the requirements of this Agreement and Cal-OSHA regulations. The purpose of the these inspections and observations is to confirm that Principal Project Company is safeguarding all people and property on the Project Site.

B. If the City observes an unsafe Project Site condition or unsafe means or methods of performing Work, the City will inform Principal Project Company's Construction Manager or PSR, who shall take whatever actions Principal Project Company deems necessary to immediately remedy the unsafe Project Site condition or unsafe work practice, or unsafe means or methods in which the Work is performed. Principal Project Company shall within 24 hours of taking such remedial action submit a report to the Engineer describing the unsafe Project Site condition or work practice, and how Principal Project Company remedied that unsafe condition, unsafe work practice, or unsafe means and methods of performing the Work.

C. The City's inspection of the Project Site and the Work, the City's observation of Principal Project Company's means and methods, and the City's requiring Principal Project Company remedy an unsafe Project Site condition, unsafe work practice, or unsafe means and methods of Work shall not in any way relieve Principal Project Company of control of and responsibility for the Site, and does not relieve Principal Project Company of its responsibility for the safety of all persons on the Project Site.

1.24 SFMTA HEALTH AND SAFETY REQUIREMENTS:

A. Principal Project Company shall comply with the following requirements as applicable and at no additional cost to the City, if any part of the work for this job is under the jurisdiction of the SFMTA and is on one of its facilities and/or affects its bus/train routes.

B. Principal Project Company shall obtain all the necessary City and SFMTA permits, trainings, clearances, and shall schedule any necessary SFMTA support at least two weeks prior to mobilization.

C. Principal Project Company employees who will perform Work within 72 inches (measured transversely) of SFMTA rail tracks shall first receive "Roadway Worker Protection" training and certification from the SFMTA, at least two weeks prior to mobilization. Principal Project Company shall schedule "Roadway Worker Protection" training by contacting the SFMTA. Principal Project Company shall sign a Hold Harmless Agreement with SFMTA with respect to the safety training.

D. In addition, and at least two weeks prior to mobilization, Principal Project Company shall obtain a "Track Access Clearance Permit" from SFMTA's Operations Control Center (OCC) before

working within 72 inches of the rail tracks. Principal Project Company shall schedule the “Track Access Clearance Permit” training by contacting SFMTA.

E. All Principal Project Company personnel performing Work along a trackway or adjacent to a trackway shall comply with any instruction given by SFMTA Operations Control Center (OCC).

F. Principal Project Company is alerted to the presence of the Overhead Contact System (OCS). The overhead contact system is above each trolley coach route and track, and adjacent to each platform. This is a HIGH VOLTAGE SYSTEM operating in excess of 600 volts DC. Principal Project Company’s attention is directed to Article 37 of the California Public Utilities Commission General Order 95. Cal/OSHA regulations require that any boom type equipment that moves vertically must maintain 10 feet radial clearance and any other equipment must maintain a 6 feet clearance from OCS. Principal Project Company shall use only fiberglass ladders when working around the OCS. Principal Project Company shall obtain “clearance to start work” from the SFMTA facility’s supervisor when working within 10 feet of the OCS, at least two weeks prior to performing that Work.

G. Principal Project Company shall comply with California Public Utilities Commission's General Order 175-A and the SFMTA “Roadway Worker Protection” training when performing any work on or near Muni trackways.

H. Principal Project Company shall provide proof of health and safety training required by CCR, Title 8, Subsection 3203 (a)(7) and Muni Procedures SY.PR.034 – Principal Project Company Safety Program and SY.PL.003 – Roadway Worker Protection (RWP) Plan, for each employee, including employee name or other identifiers, training dates, type(s) of training and training provider. These documents are available for review and inspection from SFMTA.

I. Principal Project Company shall during the course of the Work regularly provide tail-gate trainings to all employees working in and around tracks, track switches, overhead catenary system, train signal system, and other Project specific hazards, as required by Cal-OSHA regulations and other applicable laws and as topics related to safe performance of the Work and maintenance of Project Site safety come to the attention of Principal Project Company.

J. Principal Project Company shall ensure that its employees, agents, and contractors provide and maintain personnel safety training and medical examinations in accordance with all applicable Federal, State, and local safety and health standards, rules, regulations, and orders.

K. Principal Project Company shall acquire all the proper permits, trainings, clearances, and schedule any SFMTA support as necessary, at least two weeks prior to mobilization.

L. Principal Project Company shall sign an Assumption of Risk/Waiver of Claims/Hold Harmless Agreement with SFMTA with respect to the operational and safety training.

M. Cost for all the above requirements, permits, training, and clearances is incidental and inclusive of the base bid.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 35 50 - ADDITIONAL ENVIRONMENTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes additional environmental procedures and environmental mitigation measures derived from Project specific regulatory permits and/or CEQA compliance that Principal Project Company shall follow during construction.
This section includes:

1. Documentation of Historic Resource
2. Salvage Plan
3. Interpretation of Historic Resource
4. Oral Histories
5. Tribal Cultural Resources Preservation
6. Construction Transportation and Communications Management Plan
7. Driveway and Loading Operations Plan
8. Paleontological Evaluation and Monitoring Plan
9. Vibration Sensitive Equipment at 2601 Mariposa Street (KQED Building)

1.2 DAMAGES FOR FAILURE TO MEET ENVIRONMENTAL REQUIREMENTS

A. Principal Project Company shall be liable for all Federal, State, and local regulatory fines, penalties, liquidated damages and costs arising from any Principal Project Company failure to implement mitigation measures to control environmental impacts..

1.3 PROJECT CONDITIONS

A. Principal Project Company shall familiarize itself as to the actual site conditions that may be encountered during construction by all means available, including, but not limited to, the use of USGS geologic maps.

B. Principal Project Company shall make provisions to ensure that environmental mitigation controls are consistently implemented for the project duration.

C. Pursuant to California Assembly Bill 3180 (chapter 1232), the City Planning Department at its own discretion will monitor Principal Project Company's compliance with Code and Contract requirements, including required mitigation actions for construction impacts as indicated in the final MMRP, and will report on Principal Project Company's compliance with required mitigation controls. Said monitoring and reporting activities may include, but are not limited to, qualitative, quantitative and video observations and data collection on the impacts of noise, vibration air quality, traffic, street pavement damage, water quality, cultural resources, biological resources and hazardous materials.

D. Principal Project Company shall cooperate with such monitoring activities, provide access to the Project Site and Construction Work areas to establish and secure monitoring stations, and make its facilities and records available to the City Planning Department for performing such monitoring.

E. City will issue a Notice of Determination to Principal Project Company for any detected non-compliance with the provisions herein or of any environmentally objectionable acts and the corrective action to be taken. Failure to comply will result in an assessment of liquidated damages.

PART 2 - SUBMITTALS

2.1 DOCUMENTATION OF HISTORICAL RESOURCE

A. Unless stated otherwise, the following must be submitted and approved by City Planning Department prior to issuance of a demolition permit. Principal Project Company shall undertake Historic American Building/Historic American Landscape Survey-like (HABS/HALS-like) documentation of the building features. Documentation shall be undertaken by a professional who meets the Secretary of the Interior's Professional Qualifications Standards for Architectural History, History, or Architecture (as appropriate) to prepare written and photographic documentation of the Potrero Trolley Coach Division Facility. Principal Project Company shall submit to the City Planning Department for approval the scope of the documentation which shall include the following elements:

1. Measured Drawings: A set of measured drawings shall be prepared that depict the existing size, scale, and dimension of the historic resource. City Planning Department will accept the original architectural drawings or an as-built set of architectural drawings (e.g., plans, sections, elevations). City Planning Department will assist the consultant in determining the appropriate level of measured drawings.

2. HABS/HALS-Level Photographs: Either HABS/HALS standard large-format or digital photography shall be used. All digital photography shall be conducted according to the latest National Park Service (NPS) standards. Photography shall be undertaken by a qualified professional with demonstrated experience in HABS/HALS photography. Photograph views for the data set shall include (i) contextual views, (ii) views of each side of the building and interior views, (iii) oblique views of the building, and (iv) detail views of the character-defining features. All views shall be referenced on a photographic key. This photographic key shall be on a map of the property and shall show the photograph number with an arrow to indicate the direction of the view. Historic photographs shall also be collected, reproduced, and included in the data set.

3. HABS/HALS Historical Report: A written historical narrative and report shall be provided in accordance with the HABS/HALS Historical Report Guidelines. The written history shall follow an outline format that begins with a statement of significance supported by the development of the architectural and historical context in which the structure was built and subsequently evolved. The report shall also include architectural description and bibliographic information.

4. Video Recordation: Prior to issuance of a demolition permit or site permit is issued, video documentation of the affected historical resource and its setting shall be conducted by a professional videographer, one with experience recording architectural resources. The documentation shall be narrated by a qualified professional who meets the standards for history, architectural history, or architecture (as appropriate) set forth by the Secretary of the Interior's Professional Qualification Standards (36 Code of Federal Regulations Part 61). The documentation shall include as much information as possible—using visuals in combination with narration—about the materials, construction methods, current condition, historic use, and historic context of the historical resource.

5. Softcover Book: All documentation will be reviewed and approved by the Planning Department's staff before any demolition or site permit is granted for the affected historical resource. A print-on-demand softcover book shall be produced that includes the content from the historical report, historical photographs, HABS/HALS photography, measure drawings, and field notes. The print-on-demand book shall be made available to the public for distribution. Principal Project Company shall transmit such documentation to the History Room of the San Francisco Public Library, San Francisco Architectural Heritage, the Planning Department, and the Northwest Information Center. Conduct outreach to identify other interested groups.

2.2 SALVAGE PLAN

A. Prior to any demolition that would remove character-defining features, Principal Project Company shall consult with the Planning Department as to whether any character-defining features that are proposed to be demolished may be salvaged, in whole or in part, during demolition. Principal Project Company shall make a good faith effort to salvage materials of historical interest to be utilized as part of the interpretative program).

2.3 INTERPRETATION OF THE HISTORICAL RESOURCE

A. Principal Project Company shall facilitate the development of an interpretive program focused on the history of the Project Site. The interpretive program should be developed and implemented by a qualified professional with demonstrated experience in displaying information and graphics to the public in a visually interesting manner, such as a museum or exhibit curator. Principal Project Company shall submit to the City Planning Department for approval an interpretive program plan prepared by a qualified consultant which shall include but not limited to:

1. The proposed format and the publicly accessible location of the interpretive content, as well as high-quality graphics and written narratives.

2. The proposal prepared by the qualified consultant describing the general parameters of the interpretive program shall be approved by City Planning Department prior to issuance of the architectural addendum to the site permit.

3. The detailed content, media, and other characteristics of such an interpretive program shall be approved by City Planning Department prior to issuance of a Temporary Certificate of Occupancy.

4. Installation of permanent on-site interpretive displays or screens in publicly accessible locations.

5. Historical photographs, including some large-format photographs required by Article 2.1(A), may be used to illustrate the Project Site's history.

6. Educational information for future visitors and occupants to learn about the property's historical themes, associations, and lost contributing features within broader historical, social, and physical landscape contexts.

2.4 ORAL HISTORIES

A. Principal Project Company shall undertake an oral history project on the resource that may include interviews of people such as former SFMTA employees, or other community members who may offer informative historic perspectives on the history and significance of the resource. The project shall be conducted by a professional historian in conformance with the Oral History Association's Principles and Best Practices (https://www.oralhistory.org/principles-and-best-practices-revised-2018/). In addition to transcripts of the interviews, the oral history project shall

include a narrative project summary report containing an introduction to the project, a methodology description, and brief summaries of each conducted interview. Copies of the completed oral history project shall be submitted to the San Francisco Public Library, Planning Department, and other interested historical institutions. The oral history project shall also be incorporated into the interpretative program (see Article 2.3).

2.5 TRIBAL CULTURAL RESOURCES PRESERVATION

A. During ground-disturbing activities that encounter archeological resources, if the City Planning Department determines that a significant archeological resource is present, and if in consultation with the affiliated Native American tribal representatives, the City Planning Department determines that the resource constitutes a tribal cultural resource (TCR) and that the resource could be adversely affected by the proposed project, the proposed project shall be redesigned so as to avoid any adverse effect on the significant tribal cultural resource, if feasible.

B. If the City Planning Department, in consultation with the Principal Project Company, determines that preservation-in-place of the TCR would be both feasible and effective, then the archeological consultant shall prepare an archeological resource preservation plan (ARPP). Implementation of the approved ARPP by the archeological consultant shall be required when feasible.

C. If the City Planning Department, in consultation with the affiliated Native American tribal representatives and the project sponsor team, determines that preservation-in-place of the TCR is not a sufficient or feasible option, then the project sponsor team shall implement an interpretive program of the TCR in consultation with affiliated Native American tribal representatives. An interpretive plan produced in consultation with affiliated Native American tribal representatives, at a minimum, and approved by the City Planning Department, would be required to guide the interpretive program. The plan shall identify proposed locations for installations or displays, the proposed content and materials of those displays or installation, the producers or artists of the displays or installation, and a long-term maintenance program. The interpretive program may include artist installations, preferably by local Native American artists, oral histories with local Native Americans, artifacts displays and interpretation, and educational panels or other informational displays.

2.6 CONSTRUCTION TRANSPORTATION AND COMMUNICATIONS MANAGEMENT PLAN

A. Principal Project Company shall submit to SFMTA the Construction Management Plan that shall include additional measures to further minimize disruptions to people walking and bicycling, transit, and emergency vehicles during construction. The additional measures include:

1. To minimize parking demand and vehicle trips associated with construction workers, describe methods to encourage carpooling, bicycle, walk, and transit access to the Project Site by construction workers. These methods could include providing secure bicycle parking spaces, participating in free-to-employee and employer ride matching program from www.511.org, participating in emergency ride home program through the City of San Francisco (www.sferh.org), and providing transit information to construction workers.

2. To minimize construction impacts on access to nearby residence and businesses, provide nearby residences and adjacent businesses with regularly updated information regarding project construction, including construction activities, peak construction vehicles activities, travel lane closures, and parking lane and sidewalk closures. At regular intervals to be defined in the construction transportation management plan, a regular email notice will be distributed by Principal Project Company that would provide current construction information of interest to neighbors, as well as contact information for specific construction inquiries or concerns.

2.7 DRIVEWAY AND LOADING OPERATIONS PLAN (DLOP)

A. Principal Project Company to submit a Driveway and Loading Operations Plan (DLOP) to the City Planning Department for approval as a part of the application for the first temporary occupancy permit. The intent of the DLOP is to reduce potential conflicts between passenger and freight loading and transit operations, and between passenger and freight loading activities and people walking and bicycling, and other vehicles in the project vicinity, as well as to maximize reliance on onsite facilities to accommodate freight loading demand. The DLOP shall include:

1. Provisions to manage loading activities and driveway operations associated with the below-grade onsite loading spaces; and

2. Provisions for assessing on-street commercial and passenger loading supply and protocol for expanding on-street supply, if needed; and

3. Provisions for trash, recycling, and compost truck access and collection operations; and

4. Provisions for resident move-in and move-out operations for the HCC; and

5. Provisions for scheduling deliveries for SFMTA and IFM Principal Project Company using the onsite loading facilities; and

6. Provisions for accommodating recurring deliveries such as UPS, Federal Express, and USPS within the onsite loading facilities.

2.8 PRECONSTRUCTION PALEONTOLOGICAL EVALUATION AND MONITORING PLAN DURING CONSTRUCTION

A. Principal Project Company shall engage a qualified paleontologist consultant as recommended by the Society of Vertebrate Paleontology standards (SVP 2010) and Best Practices in Mitigation Paleontology (Murphey et al. 2019), or as otherwise approved by City Planning Department, to develop a site-specific monitoring plan prior to commencing soil-disturbing activities at the Project Site. The Preconstruction Paleontological Monitoring Plan shall determine construction activities requiring paleontological monitoring based on those that may affect sediments with moderate sensitivity for paleontological resources. Principal Project Company shall submit the Preconstruction Paleontological Monitoring Plan to the City Planning Department for approval prior to issuance of any demolition permit. The plan shall include but not be limited to:

1. Project description.

2. Regulatory environment; outline applicable federal, state and local regulations.

3. Summary of sensitivity classification(s).

4. Research methods, including but not limited to:

    a. Field studies conducted by the approved paleontologist to check for fossils at the surface and assess the exposed sediments.

    b. Literature Review to include an examination of geologic maps and a review of relevant geological and paleontological literature to determine the nature of geologic units in the project area.

    c. Locality Search to include outreach to the University of California Museum of Paleontology in Berkeley.

5. Results which include a summary of literature review and finding of potential site sensitivity for paleontological resources; and depth of potential resources if known.

6. Recommendations for any additional measures that could be necessary to avoid or reduce any adverse impacts to recorded and/or inadvertently discovered paleontological resources of scientific importance. Such measures could include:

    a. Avoidance: If a known fossil locality appears to contain critical scientific information that should be left undisturbed for subsequent scientific evaluation.

    b. Fossil Recovery: If isolated small-, medium- or large-sized fossils are discovered during field surveys or construction monitoring, and they are determined to be scientifically significant, they should be recovered. Fossil recovery may involve collecting a fully exposed fossil from the ground surface, or may involve a systematic excavation, depending upon the size and complexity of the fossil discovery.

    c. Monitoring: Monitoring involves systematic inspections of graded cut slopes, trench sidewalls, spoils piles, and other types of construction excavations for the presence of fossils, and the fossil recovery and documentation of these fossils before they are destroyed by further ground disturbing actions. Standard monitoring is typically used in the most paleontologically sensitive geographic areas/geologic units (moderate, high and very high potential); while spot-check monitoring is typically used in geographic areas/geologic units of moderate or unknown paleontological sensitivity (moderate or unknown potential).

    d. Data recovery and reporting: Fossil and associated data discovered during soils disturbing activities should be treated according to professional paleontological standards and documented in a data recovery report. The plan should define the scope of the data recovery report.

2.9 STORMWATER MANAGEMENT ORDINANCE, STORMWATER CONTROL PLAN

A. Principal Project Company shall submit the Final Stormwater Control Plan to San Francisco PUC prior to submitting the Architectural building permit to the San Francisco Department of Building Inspection (SFDBI).

PART 3 - EXECUTION

3.1 VIBRATION SENSITIVE EQUIPMENT AT 2601 MARIPOSA STREET (KQED HEADQUARTERS)

A. Prior to issuance of any construction permits (e.g.) site permit, demolition permit, etc.), Principal Project Company shall implement the following measures related to the KQED Headquarters located at 2601 Mariposa Street:

1. Community Liaison

    a. Designate and make available a community liaison to respond to vibration complaints from building occupants at the KQED Headquarters located at 2601 Mariposa Street.

    b. Contact information for the community liaison shall be posted in a conspicuous location so that it is clearly visible to building occupants most likely to be disturbed.

c. Provide notification, through the community liaison, to property owners and occupants at 2601 Mariposa Street at least 10 days prior to construction activities involving equipment that can generate vibration capable of interfering with vibration-sensitive equipment and inform them of the estimated start date and duration of vibration-generating construction activities.

d. Equipment types capable of generating such vibration include an impact pile driver, or similar equipment, operating within 250 feet of the building or a vibratory roller, or similar equipment, operating within 125 feet of the building. If feasible, the project sponsor team shall identify potential alternative equipment and techniques that could reduce construction vibration levels. Alternative equipment and techniques may include, but are not limited to:

   1) Pre-drilled piles; and

   2) Caisson drilling; and

   3) Oscillating or rotating pile installation; and

   4) Jetting piles into place using a water injection at the tip of the pile could be substituted for driven piles, if feasible, based on soil conditions; and

   5) Static rollers could be substituted for vibratory rollers in some cases.

e. If concerns prior to construction or complaints during construction related to equipment interference are identified, the community liaison shall work with the affected building occupants to resolve the concerns such that the vibration control measures would meet a performance target of the 65 VdB vibration level threshold for vibration sensitive equipment, as set forth by Federal Transit Authority. To resolve concerns raised by building occupants, the community liaison shall convey the details of the complaint(s) to the project sponsor team, such as who shall implement specific measures to ensure that the project construction meetings the performance target of 65 VdB vibration level for vibration sensitive equipment. These measures may include evaluation by a qualified noise and vibration consultant, scheduling certain construction activities outside the hours of operation or recording periods of specific vibration-sensitive equipment if feasible, and/or conducting ground-borne vibration monitoring to document that the project can meet the performance target of 65 VdB at specific distances and/or locations. Ground-borne vibration monitoring, if appropriate to resolve concerns, shall be conducted by a qualified noise and vibration consultant.

3.2 PALEONTOLOGICAL MONITORING DURING CONSTRUCTION

A. Principal Project Company's approved paleontologist consultant described above in Section 2.8 shall document the monitoring conducted according to the Preconstruction Paleontological Monitoring Plan (see subsection 2.8 of this Section) and any data recovery completed for significant paleontological resource finds discovered, if any. Principal Project Company's approved paleontologist shall submit a final monitoring report and any data recovery report to the City Planning Department for approval prior to the certificate of occupancy.

3.3 INADVERTENT DISCOVERY OF PALEONTOLOGICAL RESOURCES

A. Worker Awareness Training - Prior to commencing construction, and ongoing throughout ground disturbing activities (e.g., excavation, utility installation, etc.) the project sponsor team and/or their designee shall ensure that all project construction workers are trained on the contents of the Paleontological Resources Alert Sheet, as provided by the City Planning Department. The Paleontological Resources Alert Sheet shall be prominently displayed at the

construction site during ground disturbing activities for reference regarding potential paleontological resources.

B. In addition, the project sponsor team shall inform the contractor and construction personnel of the immediate stop work procedures and other procedures to be followed if bones or other potential fossils are unearthed at the project site. Should new workers that will be involved in ground disturbing construction activities begin employment after the initial training has occurred, the construction supervisor shall ensure that they receive the worker awareness training as described above.

C. The project sponsor team shall complete the standard form/affidavit confirming the timing of the Paleontological Resources worker awareness training to the City Planning Department. The affidavit shall confirm the project's location, the date of training, the location of the informational handout display, and the number of participants. The affidavit shall be transmitted to the City Planning Department within five (5) business days of conducting the training.

D. In the event of the discovery of an unanticipated paleontological resource during construction, Principal Project Company shall temporarily halt ground disturbing activities within 25 feet of the find until the discovery is examined by a qualified paleontologist as recommended by the Society of Vertebrate Paleontology standards (SVP 2010) and Best Practices in Mitigation Paleontology (Murphy et al. 2019). Work within the sensitive area shall resume only when deemed appropriate by the qualified paleontologist in consultation with the City Planning Department.

E. The qualified paleontologist shall determine:

1. If the discovery is scientifically significant; and

2. The necessity for involving other responsible or resource agencies and stakeholders, if required or determined applicable; and

3. Methods for resource recovery.

F. If the qualified paleontologist determines that the discovery is not scientifically important, the qualified paleontologist shall document this conclusion in a Paleontological Evaluation Letter to demonstrate compliance with applicable statutory requirements (e.g., Federal Antiquities Act of 1906, CEQA Guidelines Section 15064.5, California Public Resources Code Chapter 17, Section 5097.5, Paleontological Resources Preservation Act 2009). Principal Project Company shall submit the Paleontological Evaluation Letter to the City Planning Department for review within 30 calendar days of the discovery.

G. If the qualified paleontologist determines that the discovery is of scientific importance, and there are no feasible measures to avoid disturbing this paleontological resource, the qualified paleontologist shall prepare and submit to the City Planning Department for approval a Paleontological Mitigation Program. The mitigation program shall include measures to fully document and recover the resource of scientific importance. The qualified paleontologist shall submit the mitigation program to the City Planning Department for review and approval within 10 business days of the discovery. Upon approval by the City Planning Department, ground disturbing activities in the project area shall resume and be monitored as determined by the qualified paleontologist for the duration of such activities.
The mitigation program shall include:

1. Procedures for construction monitoring at the Project Site.

2. Fossil preparation and identification procedures.

3. Curation of paleontological resources of scientific importance into an appropriate repository.

4. Preparation of a Paleontological Resources Report (report or paleontology report) at the conclusion of ground disturbing activities.

H. If a Paleontological Mitigation Program is required, Principal Project Company shall prepare and submit a Paleontological Resources Report to the City Planning Department for review within 30 calendar days from consultation of the ground disturbing activities, or as negotiated with the City Planning Department. The report shall include:

1. Date of field work; and

2. Results of monitoring; and

3. Fossil identifications to the lowest possible taxonomic level; and

4. Analysis of the fossil collection; and

5. Conclusions; and

6. Locality forms; and

7. An itemized list of specimens; and

8. Repository receipt from the curation facility.

I. Principal Project Company shall be responsible for the preparation and implementation of the mitigation program, in addition to any costs necessary to prepare and identify collected fossils, and for any curation fees charged by the paleontological repository. The paleontology report shall be submitted to City Planning Department for review within 30 business days from conclusion of ground disturbing activities, or as negotiated following consultation with City Planning Department.

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Principal Project Company shall provide and maintain construction facilities and temporary controls as required to perform the D&C Work relocate as required by the progress of the Work.

2. Unless otherwise required by the City, materials for construction facilities and temporary controls may be new or used, and shall be suitable for the purposes intended.

3. Materials, installation and maintenance of construction facilities and temporary controls shall comply with applicable regulatory requirements.

4. Principal Project Company shall maintain construction facilities in sound, neat and clean condition, and remove any graffiti and repair any vandalism to the satisfaction of the City.

5. Principal Project Company shall remove construction facilities and controls, including associated utilities and equipment, when their use is no longer required.

B. Related Sections:

1. Section 01 77 00 - Closeout Procedures.

1.2 OPERATION HOURS FOR TEMPORARY CONTROLS

A. Principal Project Company shall provide and maintain temporary pumping, piping, power, lighting, controls, instrumentation, alarms, security devices, and all required safety devices at all times. Such items shall be made available for immediate use when Principal Project Company’s operations impact existing systems.

1.3 TEMPORARY ELECTRICITY

A. Principal Project Company shall provide and pay for electrical service and weatherproof, grounded distribution system of sufficient size, capacity, and power characteristics during the construction period. Existing on-site City electrical facilities are not available for Contractor’s use.

1.4 TEMPORARY LIGHTING

A. Principal Project Company shall provide and maintain lighting for Construction Work, including power to distribution boxes. Required illumination may be provided by approved cord sets with lamp guards. Principal Project Company shall provide and maintain temporary lighting whenever new permanent lighting fixtures are switched over from existing lighting.

1.5 TELEPHONE SERVICE

A. Principal Project Company shall provide, maintain and pay for telephone service to Principal Project Company's field office from the time of project mobilization.

1.6 TEMPORARY WATER SERVICE

A. Potable Water: Principal Project Company shall arrange with the San Francisco Water Department to provide potable water by connecting to City water systems.

1. Contact the Water Department at 415-923-2400 for arranging such water service.

2. Water is available from fire hydrants located in the streets. Obtain permission from the San Francisco Fire Department to use hydrants.

3. Pay the costs of connection fees, meters, and all water furnished by the San Francisco Water Department under the water service account established above.

B. Principal Project Company is advised that Ordinance # 175-91, Article 21, Section 1100 to 1107 of the San Francisco Municipal Code (Public Works Code), restricts the use of potable water for soil compaction or dust control activities, to the extent not directly in conflict with any applicable federal, state and local law.

1. In consideration for potential health concerns, an exemption may be allowed for the use of potable water for soil compaction or dust control activities when human contact and exposure exists. Such exemption will be considered and may be granted on a case by case basis.

2. If Principal Project Company seeks to use potable water for soil compaction or dust control activities, Principal Project Company, shall apply for, and obtain an exemption pursuant to Ordinance #175-91, Article 21, prior to its use. The application for such use of potable water is to be sent to the Department of Public Health, Environmental Health Section, 1390 Market St., Room 910, San Francisco, CA 94102, Telephone 415-252-3945. Permission for such use may be granted by the General Manager of the Water Department, pursuant to Ordinance #175-91, Article 21.

C. Reclaimed Water: Principal Project Company shall arrange with the SEWPCP to provide reclaimed water for soil compaction and dust control which is available at no cost to Principal Project Company at the SEWPCP from 8:00 A.M. to 5:00 P.M. on weekdays and Saturdays.

1. Arrangements can be made for access to reclaimed water at other times.

2. A permit is required to obtain reclaimed water from the City. Contact mfisher@sfwater.org and/or (415) 695-7378 at least three (3) days prior to the date that reclaimed water is required. See http://sfwater.org/modules/showdocument.aspx?documentid=7234 for more information.

D. Principal Project Company shall provide its own water tanker and hoses. Principal Project Company's hoses crossing traveled roadways shall be buried beneath the roadway or ramped over.

E. Principal Project Company shall provide and maintain distribution piping, water tankers, hoses, and all appurtenances necessary to supply water at the job site.

1. Bury pipe crossing traveled roadways beneath the roadway. Use hose or ramp over temporary piping on roadway surfaces.

1.7 TEMPORARY SANITARY FACILITIES

A. Principal Project Company shall provide and maintain required toilet facilities and enclosures. Location of facilities shall be a minimum of 50 feet away from the Project field office or otherwise approved by City.

B. Principal Project Company shall be responsible to provide and maintain all construction facilities, temporary controls, and temporary utilities as required to perform the work of the Contract Documents. Principal Project Company shall arrange with the utility agencies to provide and pay for such utility services required, including furnishing, installing and removing on completion of all work all temporary connections to said utilities.

C. Principal Project Company shall provide and maintain temporary toilet facilities and enclosures as required at no cost to the City.

1.8 TEMPORARY CONSTRUCTION FENCE

A. Principal Project Company shall furnish and install a temporary 6'-0" chain link construction fence with lockable gates at the limit of work and at areas to isolate and protect the public from hazardous conditions during construction.

B. Principal Project Company shall provide fencing as needed to prevent unsafe entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

C. Protect vehicular traffic, stored materials, site and structures from damage.**TEMPORARY ENCLOSURES**

A. Principal Project Company shall provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.

3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

1.10 MAINTENANCE OF THE WORK AREA

A. Principal Project Company shall maintain the work areas in a safe condition, remove all accumulations of rubbish (Principal Project Company's waste and public refuse) and surplus materials at the end of each working day, restore them to a condition equal to that which existed prior to the start of work, and leave them at completion of the contract in a clean, orderly fashion.

B. Demolished concrete, deteriorated masonry, cleared vegetation, and excavated material not indicated for reuse shall be removed from the site at the end of each working day without delay and disposed of in a legal manner.

C. Cleaning During Construction: Control accumulation of waste materials and rubbish; collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly.

1. Clean interior spaces prior to the start of finish work; maintain areas free of dust and other contaminants during finishing operations.

2. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material off-site in a lawful manner.

3. Maintain the site and all adjacent public areas in a clean and orderly condition. Maintain the site, equipment, fences and signs free of graffiti. Remove all graffiti daily using methods which cause no damage to the work or existing facilities.

4. Sweep all pedestrian walkways and dispose of debris around the site perimeter on a daily basis.

1.11 DRAINAGE CONTROL

A. Grade site to drain. Maintain excavations free of standing water.

B. Provide, operate, and maintain pumping equipment as needed to control water at the site.

C. Protect site from erosion caused by flowing water.

1.12 CONFINED SPACE ENTRY

A. It is the responsibility of Principal Project Company to provide all equipment or assistance to make the confined space safe for entry by the City or its representative per the California Administration Code, Title 8, and General Industry Safety Orders Entitled "Confined Spaces".

1.13 TEMPORARY PROJECT SIGN

A. Project sign image and layout shall conform to the graphical layout and color approved by the City.

B. Principal Project Company shall obtain the City's approval of the proposed locations, height, and mounting details for each project sign. The project signs may be mounted on construction fence, face of wall, or on posts.

C. ONESF Project Sign Fabrication:

1. Size: Project sign shall be 4-feet by 6-feet.

2. Digital File: Project sign shall match the final graphical layout provided by the City, including the colors and fonts. For more information, refer to the latest Sign Guidelines available from the following website: http://onesanfrancisco.org/ (Click on “Data + Resources > Signage and Style Guide”)

   a. The design of Principal Project Company furnished project signs shall be in strict accordance with the ‘ONESF’ Guidelines established by the City.

3. Mounting Material: Project sign shall be mounted on Medium Density Overlay board (MDO), at least 3/4-inch thick.

4. Printing: Project sign shall be printed on a 4-color CMYK printer.

5. Coating: Use UV and Anti-Graffiti coatings.

6. Quality: Project sign shall last the entire construction duration.

D. Principal Project Company shall submit a mock-up of the Project sign in color, on bond paper, 11x17 size, to the City for approval prior to fabrication.

E. Principal Project Company shall install the required project sign(s) shall maintain project sign(s) in good condition for the duration of the contract.

F. After Substantial Completion, Principal Project Company shall remove each Project sign from the site as its property, and restore area per plans or as directed by the City at no additional cost to the City.

G. Damaged Project sign that cannot be repaired on site shall be replaced at no additional cost to the City.

1.14 TEMPORARY TOW AWAY/NO-PARKING SIGNAGE

A. On January 1, 2017, temporary occupancy permits and all other permits that include tow-away signage, aside from excavation permits activated through 311, will not be activated and permittees will not have tow away rights unless and until time and date stamped photos evidencing that signage was posted in the correct location a minimum of 72 hours prior to the time at which the parking restrictions shall become effective under the permit have been uploaded to the San Francisco Public Works, Bureau of Street Use and Mapping (SFPW/BSM) Tow-Away Sign Database. See Appendix B – Tow-Away Sign Activation and Photo Upload Process.

B. Principal Project Company is advised that Sign Ordinance PWC Article 15, Section 724 which will require the applicant (Principal Project Company) to input the amount of right of way they will occupy during construction activities for a specific permit, to be issued by SFPW/BSM for all work in the Public Right-of-Way. Principal Project Company shall enter times of operation during construction with the proposed start and end times and specific calendar days. This information will be printed on the tow-away signs. Refer to Tow Away Manual at http://www.sfpublicworks.org/sites/default/files/4506-Tow-Away%20User%20Guide.pdf.

1. The location of the Construction Zone will be entered as part of the excavation permit, which will include the length of occupancy (distance in linear feet). This information and date. Once a permit has been approved, the applicant is informed off the approval via email and will be provided a hyperlink to create/modify the tow/away signs prior to printing.

2. The information required at time of permit will update the database and will validate that the total linear footage of construction occupancy does not exceed 1,200 linear feet. Upon completion of any adjustment to the tow-away signs, the applicant can determine which street segment to print out and may choose to either print one of two general tow-away sign template or request the Department of Public Works to print the tow-away signs. Principal Project Company shall pay for the printing of each sign.

3. Size: Tow-Away/No-Parking Signs shall be 11’ wide x 17’ tall.

4. Digital File: Project sign shall match the final graphical layout provided by the City, including the colors and fonts. The design of Principal Project Company furnished project signs shall be in strict accordance with the DPW Order for Towaway Signs located at: http://sfpublicworks.org/sites/default/files/4508-TowAway-2015-Template.pdf.

5. Principal Project Company shall use only paper types which shall be waterproof durable; tear resistant’ with laser paper labels type and templates: 11 x 17 10 PT CV, 215 grams/m^2

6. Printing: Project sign can be printed on a Xerox Phaser 7800, or equivalent that can print 11x17 120-130 lb paper. All Tow-Away/No-Parking Signs shall be secured and paid for by Principal Project Company.

7. Principal Project Company shall maintain Tow-Away/No-Parking Sign (s) in good condition as needed throughout the duration of the Contract.

8. After substantial completion, Principal Project Company shall remove each Tow-Away/No-Parking Sign from the site as its property.

9. Damaged Tow-Away/No-Parking Sign that cannot be repaired on site shall be replaced at no additional cost to the City.

1.15 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Principal Project Company shall:

1. Remove temporary above grade or buried utilities, construction equipment, temporary structures and facilities, unused materials, rubbish and debris prior to Final Inspection. Restore facilities to conditions prior to construction, to the satisfaction of the City.

2. Clean and repair damage caused by installation or use of temporary work.

3. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

4. Remove field offices and temporary utility services from the Site.

1.16 STORAGE AND STOCKPILING

A. Principal Project Company shall make its own arrangements for off-site storage or shop areas and off-site construction parking facilities. On-site storage shall be limited to materials and equipment currently being installed or utilized.

B. If necessary, Principal Project Company shall arrange for temporary off-site storage of equipment and materials at its discretion. No additional compensation shall be provided from the City.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

Beginning on January 1, 2017, temporary occupancy permits and all other permits that include tow-away signage, aside from excavation permits activated through 311, will not be activated and permittees will not have tow-away rights unless and until time and date stamped photos evidencing that signage was posted in the correct location a minimum of 72–hours prior to the time at which the parking restrictions are to become effective under the permit have been uploaded to the Bureau of Street-Use and Mapping Tow-Away Sign Database.

San Francisco Public Works

1155 Market Street, 3rd Floor
San Francisco CA, 94103
Phone: (415) 554-5810
Fax: (415) 554-6161

Processing Hours: 7:30 AM-4:00 PM
Monday through Friday, except official holidays

311 *Contact 311 for complaints*

Printed on 30% post-consumer recycled stock

Tow-Away Sign Activation and Photo Upload Process

SAN FRANCISCO PUBLIC WORKS

www.sfpublicworks.org

Public Works Tow-Away Sign Activation and Photo Upload Process

EFFECTIVE DATE: January 1, 2017

PERMITS AFFECTED:

The tow-away sign activation and photo upload process change is applicable to all temporary occupancy permits and all other permits that include tow-away signage.

Excavation permits activated through 311 will not be impacted.

ACTIVATION AND PHOTO UPLOAD PROCESS:

STEP 1: Request a street space permit from Public Works.

STEP 2: Once permit is approved a link for tow-away signs will be provided via email along with a link to the Bureau of Street-Use and Mapping tow-away sign database.

STEP 3: Print signs and post them at the permitted location every 20 feet no less than 72 hours in advance of the time the parking restrictions are to become effective.

STEP 4: Click on the link provided in the confirmation email and take photos showing the placement of the signs.

STEP 5: Click submit and the photos will be submitted to Bureau of Street-Use and Mapping for review.

STEP 6: A confirmation email will be sent stating the photos were accepted, the permit is active, and tow-away rights are reserved.

NOTE: If photos are inadequate, you will receive a rejection email identifying the deficiencies to be corrected.

PHOTO REQUIREMENT 1:

A scene-setting photo clearly showing the signs are posted in the permitted location every 20 feet.

PHOTO REQUIREMENT 2:

A close-up photo of a tow-away sign that enables essential information on the sign to be confirmed.

END OF SECTION

SECTION 01 57 26 - TEMPORARY PROTECTION OF CATCH BASINS AND STORM DRAIN INLETS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Documenting and protecting catch basins and storm drain inlets as incidental work.

1.2 RELATED SECTIONS

A. 01 71 33 - Protection of Adjacent Construction

PART 2 - PRODUCTS

2.1 MATERIALS

A. Principal Project Company shall provide all labor and materials necessary to protect debris from entering the sewer system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Principal Project Company shall photograph all catch basins within the limits of work. Each catch basin shall have at least two photos, one from the top view and one from the side view along the flow line. Refer to Section 01 71 33-1.6B.

B. Principal Project Company shall notify the City of any clogged catch basin or storm water inlet immediately upon discovery.

1. Call SFPUC Sewer Operations at 415-695-2096 to report catch basins or storm water inlets containing debris in the barrels and/or cast iron traps.

3.2 DRAINAGE PROTECTION

A. Principal Project Company shall be responsible for protecting and keeping in operation all storm water inlets and catch basins throughout the entire Project Site for the duration of the Project until Final Acceptance.

B. Principal Project Company shall take adequate measures to prevent the impairment of the operation of the sewer system. Principal Project Company shall prevent construction material, pavement, concrete, earth, paints, thinner, solvents, and other debris or toxic material from entering a sewer or sewer structure including surface flow collection system, such as catch basins and culverts.

C. Prior to the final inspection and acceptance, Principal Project Company shall check all storm water inlets and catch basins within the project limits for debris.

END OF SECTION

SECTION 01 71 33 - PROTECTION OF EXISTING FACILITIES AND ADJACENT CONSTRUCTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes requirements for protection of existing facilities and improvements.

1.2 RELATED SECTIONS

A. Section 01 50 00 –Temporary Facilities and Controls

1.3 EXISTING UTILITIES AND IMPROVEMENTS

A. Principal Project Company shall:

1. Notify Underground Service Alert (USA) prior to excavating in the public right of way areas so that Utility Owners may be advised of the work and may field mark or otherwise protect and warn Principal Project Company of their existing utility lines. Contact USA, telephone 1-800-227-2600, or refer to USA website for more information at: http://www.usanorth.org/.

    a. Provide reasonable access and do not hinder or otherwise interfere with any company or agency having underground facilities in removing, relocating, or protecting such facilities.

2. Verify the actual locations and depths of all utilities indicated or field marked. Make a sufficient number of exploratory excavations at Principal Project Company's expense of all utilities that may interfere with the work sufficiently in advance of construction to avoid possible delays to Principal Project Company's work.

    a. Notify the City if such exploratory excavations show the utility location as shown or as marked to be in error.

    b. When utility lines are encountered within the area of Principal Project Company's operations, notify the City and the Utility Owners sufficiently in advance for the necessary protection measures to be taken to prevent interruption of service or delay to Principal Project Company's operations.

B. Principal Project Company shall protect all existing utilities, facilities, and structures, public or private, and will be held responsible for all damage caused by Principal Project Company not exercising due care to avoid such damage.

C. Overhead Contact System: Work on or under the overhead contact system shall be performed with lines and feeders energized unless shutdown of the system is granted. Notify the SFMTA at least 10 days prior to performing work on energized overhead trolley wires, feeder circuits, or at substations, so that the SFMTA may arrange for any necessary clearances and inspections.

1. Principal Project Company is alerted to the condition that overhead trolley wires and feeder cables distribute electrical energy at up to 700 Volts dc. Comply with the "High Voltage" provisions of the California Code of Regulations (Title 8, Division 1, Chapter 4, and Subchapter 5).

2. Take precautions to avoid accidents and damage to the overhead contact wires, and riser and feeder cables.

D. Survey Monuments and Bench Marks: Principal Project Company shall bring to the attention of the City all survey monuments, bench marks, property line marks and the like, encountered on the work. Survey monuments, bench marks, or other survey marks or points shall not be removed or disturbed until referenced or relocated by the City or other agency or party having an interest therein, and then removed only at the time and in the manner specifically approved by the City. Principal Project Company shall bring all City monument frames within the limits of the work to grade, with the express provision that any and all work associated with the removal and relocation of such frames, with their covers, shall be under the direct supervision of the City, and all such work shall be considered incidental work. The cost of re-establishing and resetting survey monuments, bench marks or other survey marks or points lost or destroyed through the carelessness or negligence of, or inadvertently by, Principal Project Company shall be at the sole expense of Principal Project Company.

1.4 SAFEGUARDING OF EXISTING FACILITIES

A. Principal Project Company shall perform all work, including dewatering operations, in such a manner as to avoid damage to existing fire hydrants, power poles, lighting standards, and all other existing utilities, facilities, trees and vegetation, and structures. Principal Project Company shall be responsible for any damage due to its failure to exercise due care.

B. Broken concrete, debris, etc., shall be immediately removed from the Project Site as Principal Project Company's property and shall be disposed of in a legal manner.

C. Principal Project Company shall take adequate measures to prevent the impairment of the sewer system and to prevent construction material, pavement concrete, earth or other debris from entering a sewer, sewer structures, catch basin, or storm water inlet. Principal Project Company shall restore damaged utilities and facilities to a condition equal to or better than they were prior to such damage.

1.5 RESTORATION OF PAVEMENT

A. General: All paved areas cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing undisturbed areas, except where specific resurfacing requirements are called for in the Contract Documents or in the permit requirements of the Governmental Entity issuing the permit. All pavements which are subject to partial removal shall be neatly saw cut in straight lines.

B. Conserving Distinctive Sidewalk Elements: For work located within landmark and/or conservation historic districts, all distinctive sidewalk elements such as brick surfacing, brick gutters, granite curbs, cobblestones, non-standard sidewalk scoring and streetscape elements that appear to be 45 years or older will be treated as potentially character defining features of their respective historic districts.

1. Principal Project Company shall avoid damaging and protect in place any features described above and shall notify the City of any feature not identified on the plans that is in conflict with the proposed work.

2. Granite curb shall only be replaced with concrete curb on curved sections and as part of the curb ramp construction.

C. Temporary Resurfacing: Whenever required by the Authorities Having Jurisdiction, place temporary surfacing promptly after backfilling and maintain such surfacing in a satisfactory condition for the period of time before proceeding with the final restoration.

D. Permanent Resurfacing: Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in neat straight lines. All pavement restoration shall be constructed to finished grades compatible with undisturbed adjacent pavement.

E. Restoration of Sidewalks or Driveways: Wherever sidewalks, curbs and gutters, or driveways have been removed for construction purposes, place suitable temporary sidewalks, curbs and gutters, or driveways promptly after backfilling and maintain them in satisfactory condition for the period of time before the final restoration is made.

1.6 JOINT SURVEY TO ESTABLISH AUTHENTICITY OF POSSIBLE CLAIMS

A. Principal Project Company shall use such methods and shall take adequate precautions to prevent damage to existing buildings, structures, and other improvements during the prosecution of the work.

B. Principal Project Company shall retain an experienced photographer to perform preconstruction examination and, if necessary, post-construction survey of all nearby structures, including photographs of all catch basins within the limit of work and nearby intersections. Each catch basin shall have at least two photos, one from the top view, and one from the side view along the gutter line. The survey shall be made using digital still photographs or digital videos saved to compact discs. The survey shall be considered incidental work and no separate payment will be made therefor.

C. Prior to the commencement of Construction Work, the Principal Project Company shall arrange for a joint examination with the City of existing buildings, structures and other improvements in the vicinity of the Project Site, as applicable, which might be damaged by Principal Project Company's Construction Work.

D. The examination of the exterior of existing buildings, structures, and other improvements located within 25 feet of the construction excavation will be made jointly by authorized representatives of Principal Project Company, the City, and property owners. The scope of each examination shall include, but is not limited to, recording of cracks in structures, settlement, leakage and the like.

E. Records in duplicate of all observations shall be prepared and delivered by the photographer to the City and to Principal Project Company. The photographer may be required to attest to the fact that they took the pictures; however, in no case, will they determine the cause cracks, settlement, leakage, or like condition nor is photographer being retained for the purpose of engineering evaluation.

F. The above records and photographs are intended for use as indisputable evidence in ascertaining the extent of any damage which may occur as a result of Principal Project Company's operations and are for the protection of the adjacent property owners, Principal Project Company, and the City, and will be a means of determining whether and to what extent damage, resulting from Principal Project Company operations, occurred during the Construction Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 74 50 - MATERIAL REDUCTION AND RECOVERY PLAN

PART 1 - GENERAL

1.1 SUMMARY

A. This section governs the recovery of construction and demolition debris.

B. Principal Project Company is responsible for complying with all aspects of this Section.

C. On October 16, 2006, the San Francisco Mayor issued Executive Directive 06-05 requiring all construction contracts to divert 75% of construction and demolition debris from landfill disposal sites. This directive is supported by existing policies that require reuse, recycling, and management of construction and demolition debris. Some of these policies are described below.

D. The City and County of San Francisco adopted an ordinance (No. 27-06) that creates a mandatory program to maximize the recovery of all construction and demolition debris.

1. The Ordinance requires that mixed construction and demolition debris material be transported off-site by a Registered Transporter and taken to a Registered Facility.

2. Material source separated at the job site shall be taken to a facility that reuses or recycles such material.

3. This ordinance applies to all construction projects within the City and County of San Francisco, such as new construction, remodels, tenant improvements, additions, repairs, and full and partial demolitions.

4. This ordinance prohibits any construction and demolition debris from being placed in trash or sent directly to a landfill.

E. Principal Project Company shall perform all work and meet all requirements in this Section at no additional cost to the City.

F. Related Requirements:

1. Section 01 50 00 -Temporary Facilities and Controls

2. Section 01 77 00 - Closeout Procedures

1.2 REFERENCES

A. Mayor’s Executive Directive 06-05, Recycling and Resource Conservation, October 16, 2006.

B. San Francisco Environment Code

1. Chapter 5, Resource Conservation Ordinance.

2. Chapter 7, Municipal Green Building Requirements.

3. Chapter 14, Construction and Demolition Debris Recovery Ordinance.

4. Chapter 16, Food Service and Packaging Waste Reduction Ordinance.

5. Chapter 19, Mandatory Recycling and Compositing.

C. 2022 California Green Building Standards Code, Title 24, Part 11 (CALGreen): https://www.dgs.ca.gov/BSC/CALGreen

D. California Integrated Waste Management Act of 1989 (California Public Resources Code 40000 et. seq.) - Assembly Bill 939.

E. U.S. Green Building Council's Leadership in Energy and Environmental Design

1. LEED Reference Guide for Building Design and Construction version 4.0.

2. LEED Reference Guide for Interior Design and Construction version 4.0

F. Universal Waste information from the following website: Universal Waste | Department of Toxic Substances Control (ca.gov)

G. Treated Wood Waste Fact Sheet from the following website: https://dtsc.ca.gov/toxics-in-products/treated-wood-waste-information-and-fact-sheets/

H. San Francisco Board of Supervisors Resolution Nos. 530-04 and 679-02 establishing a zero waste goal.

I. Food Service Waste Reduction Ordinance as set forth in San Francisco Environment Code Chapter 16.

J. Refuse Collection and Disposal Ordinance, adopted November 8, 1932.

1.3 DEFINITIONS

A. Alternative Daily Cover (ADC): Materials, other than soil, that have been approved by the California Department of Resources Recycling and Recovery ("CalRecycle") or a successor agency for use as a temporary overlay on an exposed landfill face.

B. Beneficial Reuse: The reuse of material at a landfill that does not include ADC but does include use of materials for the following purposes: alternative intermediate cover; final cover foundation layer; liner operations layer; leachate and landfill gas collection system; construction fill; road base; wet weather operations pads and access roads; and, soil amendments for erosion control and landscaping. "Beneficial reuse" shall not include disposal of material at a landfill.

C. City-owned Facility: Any building owned by the City and County of San Francisco. "City-owned Facility" includes City-owned facilities or portions thereof that the City leases to non-City entities.

D. City Leasehold: A building or portion thereof owned by others where the City and County of San Francisco is a tenant.

E. City's Waste Tracking Platform: An on-line waste tracking platform hosted by Green Halo Systems that can be found at https://wastetracking.com/city/sfgov/ .

F. Compostable: Any material that can be broken down into, or otherwise become part of, usable compost (e.g., soil-conditioning material) in a safe and timely manner as accepted in San Francisco's compostables collection program, such as food scraps, soiled paper and plant trimmings.

G. Construction and Demolition Debris or C&D Debris: Building materials and solid waste generated from construction and demolition activities including, but not limited to, fully cured asphalt, concrete, brick, rock, soil, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, fixtures, plastic pipe, metals, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction,

deconstruction, demolition or land developments. This term does not include refuse regulated under the 1932 Refuse Collection and Disposal Initiative Ordinance or sections of the Municipal Code that implement the provisions of that ordinance or materials from the public right-of-way. Hazardous material, as defined in California Health and Safety Code section 25100, et seq., as amended, is not construction and demolition debris.

H. Disposal: The final deposition of material at a legally operating permitted landfill that does not include beneficial reuse or at a permitted transformation facility. A legally operating, permitted landfill includes Class III landfills and inert fills. Disposal of inert materials at inert fills or inert backfill sites does not constitute recycling.

I. Diversion: Use of material for any purpose other than disposal in a landfill or transformation facility, such as source reduction, reuse, recycling, and composting activities that do not result in material being disposed at permitted landfills and transformation facilities.

J. Landfill: A facility that (i) accepts for disposal in or on land non-hazardous material such as household, commercial, and industrial waste, and waste generated during construction, remodeling, repair and demolition operations, and (ii) has a valid current solid waste facilities permit from the California Department of Resources Recycling and Recovery (CalRecycle).

K. Mixed Construction and Demolition Debris Material or Mixed C&D Debris Material: Construction and demolition (C&D) debris or C&D debris that are combined on the project site and hauled away for sorting.

L. Recover or Recovery: Any activity, including source reduction, deconstruction and salvaging, reuse, recycling, composting, or anaerobic digestion which causes materials to be recovered for use as a resource and diverted from disposal. Recovery shall not include engineered municipal solid waste conversion.

M. Recyclable Material: Any material or product that can be sorted and reconstituted, for the purpose of using the altered form in the manufacture of a new product, as accepted in San Francisco's recycling collection program, such as paper, bottles and cans. Recycling does not include burning, incinerating, converting, or otherwise thermally destroying solid waste.

N. Recycling: The process of collecting, sorting, cleansing, treating, and reconstituting materials that would otherwise become solid waste, and returning them to the economic mainstream in the form of raw material for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace. Recycling does not include burning, incinerating, or thermally destroying solid waste, nor shall it include disposal.

O. Recycling Facility: An operation or person that collects and processes materials for recycling.

P. Registered Transporter: Anyone who is hired to remove Mixed Construction and Demolition Debris Material from a construction and/or demolition site in San Francisco, using a vehicle with more than two axles or two tires per axle (such as a large pickup truck with four tires on the rear axle or three-axle dump trucks) and is hauling at least one (1) cubic yard of Mixed Construction and Demolition Debris Material and holds a valid registration from the City and County of San Francisco pursuant to Chapter 14 of the Environment Code. A Registered Transporter is obligated to take all mixed material only to a Registered Facility.

Q. Registered Facility: Any facility that accepts Mixed Construction and Demolition Debris Material for processing and recycling and holds a valid registration issued by the City and County of San Francisco pursuant to Chapter 14 of the Environment Code.

R. Reuse: Using an object or material again either for its original purpose or for a similar purpose without significantly altering the physical form of the object or material.

S. Source Reduction: Any action which causes a net reduction in the generation of solid waste. Source reduction includes, but is not limited to, reducing the use of non-recyclable materials, replacing disposable materials and products with reusable materials and products, reducing packaging, reducing the amount of yard wastes generated, establishing garbage rate structures with incentives to reduce waste tonnage generated, and increasing the efficiency of the use of paper, cardboard, glass, metal, plastic, and other materials.

T. Source Separated Materials: Materials that have been separated or kept separate from the solid waste stream, at the point of generation, for the purpose of reuse, recycling or composting in order to return them to the economic mainstream in the form of raw material for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace.

U. Solid Waste: Materials designated as non-recyclable and discarded for the purposes of disposal.

V. Universal Waste (CCR Title 22, Division 4.5, Chapter 23): Certain specified hazardous materials that are more common and pose a lower risk to people and the environment than other hazardous materials. Universal wastes are handled with reduced management requirements. Examples of universal waste: batteries, fluorescent tubes (lamps), electronic devices (cell phones, computers, televisions), cathode ray tubes (CRTs), mercury wastes (thermometers and toys), and non-empty aerosol cans.

W. Treated Wood Waste (CCR Title 22, Division 4.5, Chapter 34): Dimensional lumber and other wood products which have been removed from service and were treated with preserving chemicals that protect the wood from insect attack and fungal decay during its use. Examples include fence posts, sill plates, landscape timbers, pilings, railroad ties, guardrails, and decking. Treated Wood Waste is a hazardous material in California and must be managed according to specific regulations.

X. Waste Diversion: a management activity that disposes of waste through methods other than incineration or landfilling. Examples include reuse and recycling.

1.4 GENERAL REQUIREMENTS

A. Recovery Goal: In order to meet the City's zero waste goal, the goal for this Project is to recover no less than 75% of the construction and demolition debris material from landfill disposal through waste prevention, reuse, and recycling. If a construction site contains Hazardous Materials and/or Universal Wastes, the 75% minimum recovery requirement shall pertain to all non-Hazardous Material. No construction and demolition debris material shall be disposed in garbage or taken directly to landfill.

B. In order for construction and/or demolition debris to be considered hazardous, such as containing asbestos or lead, it shall be evaluated and determined to be hazardous by an independent professional such as a Cal/OSHA or DOSH Certified Asbestos Consultant. The waste determination and other verification shall be included with the C&D Debris Management Plan (refer to Paragraph 1.5 below), together with a list of hazardous materials found at the project site and plans for proper disposal.

C. All Hazardous Materials, including Universal Wastes and Treated Wood Waste, shall be documented separately, and a summary of all manifests or other disposal documentation, including material description and weights, shall be provided to the City.

D. Highest and Best Use: Principal Project Company shall employ the following hierarchy of highest and best use for handling construction and demolition debris as follows:

1. Implement reduced material usage or reuse of materials before any recycling;

2. Implement recycling or reuse of source separated material before any recycling of mixed construction and demolition debris material;

3. Implement recycling of mixed construction and demolition debris material before all other forms of disposal.

E. Recycling Requirements:

1. Source Separated Materials: Principal Project Company shall develop and implement procedures for source-separation, to the greatest extent feasible, of the following types of recyclable or reusable materials:

a. Asphalt.

b. Acoustical ceiling tiles.

c. Bricks, stone(s), granite, and other finished stone-type materials.

d. Carpet and padding.

e. Concrete, concrete block, slump stone (decorative concrete block).

f. Corrugated cardboard.

g. Dimensional lumber and beams.

h. Fixtures, hardware, doors, and windows.

i. Metal, ferrous and non-ferrous.

j. Mixed Inerts.

k. Rigid plastic.

l. Soil/dirt/rock.

m. Trees, Landscape Debris, cleared vegetation and cut-off or other wood scraps.

n. Wall board, gypsum sheetrock.

2. Mixed Construction & Demolition Debris Material:

a. For projects within the legal and geographical boundaries of the City and County of San Francisco, mixed C&D debris material must be taken to a Registered Facility by a Registered Transporter, per Environment Code 14. Registered Facilities Recovery (Diversion) Rates are listed at: https://sfenvironment.org/construction-demolition-resources

b. For projects outside San Francisco, if mixed C&D debris material is taken to a non-Registered Facility the diversion rate approved by the local jurisdiction shall be used, and official documentation of the diversion rate approved by the local jurisdiction must be provided by Principal Project Company. If a facility does not have a locally approved recovery/recycling rate, the recovery (diversion) rate is calculated as zero.

3. Handling of Recyclable Materials:

    a. Principal Project Company shall assure that recyclable or reusable materials be free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process. Principal Project Company shall clean materials that are contaminated before placing it in collection containers.

    b. Principal Project Company shall arrange for collection of reusable and recyclable materials by delivery to the appropriate reuse and/or recycling centers for purposes of reuse and/or recycling.

    c. All mixed C&D debris material from projects in San Francisco must be taken to a Registered Facility authorized to process the material, and it must be hauled by a Registered Transporter. For the lists of Registered Facilities and Registered Transporters refer to the website: https://sfenvironment.org/construction-demolition-resources

4. No construction and demolition debris shall be burned, buried or otherwise disposed of on the project site.

F. Principal Project Company is prohibited from sending any construction and demolition debris directly to landfill or to any facility that would incinerate or otherwise process such debris using high temperature technology without submitting a written request to and receiving approval from the San Francisco Department of the Environment; see Form A and Form B.

G. Requirements only for construction contracts within the legal and geographical boundaries of the City and County of San Francisco:

1. Registered Transporters and Registered Facilities: Only Registered Transporters can remove mixed C&D debris material and they must take this material to a Registered Facility. Source separated material at the job site shall be taken to the appropriate recycling or reuse facility.

    a. For a list of Registered Facilities and Registered Transporters refer to the website: https://sfenvironment.org/construction-demolition-resources

2. Full Demolition Requirements: Principal Project Company conducting full demolition of an existing structure must submit a Demolition Debris Recovery Plan (DDRP) to the San Francisco Environment Department (SFED).

    a. The DDRP must demonstrate a minimum of 75% recovery from landfill of demolition debris, including materials source separated for reuse or recycling.

    b. The DDRP must be submitted to and approved by SFED before the Department of Building Inspection will issue a Full Demolition Permit.

    c. This requirement does not apply to City construction contracts outside of the legal and geographical boundaries of the City and County of San Francisco.

    d. The DDRP is available at the following website: https://sfenvironment.org/construction-demolition-resources

H. Mixed C&D debris material from projects outside the legal and geographical boundaries of the City and County of San Francisco must be taken to a Recycling Facility that processes the material to achieve maximum recycling. If the material is taken to a facility not registered with San Francisco, the local jurisdiction’s recycling rate for that facility shall be used provided official documentation from the local jurisdiction is attached to all submittals as required in Paragraphs

1.5, 1.6 and 1.7 below. If a facility does not have a local approved recycling rate, the diversion rate is calculated as zero.

I. Universal Wastes: Principal Project Company shall handle and dispose of all hazardous material, including Universal Waste in accordance with the requirements of the California Department of Toxic Substances Control (DTSC). Refer to DTSC website: www.dtsc.ca.gov. In general, Universal Waste may not be discarded in solid waste landfills or with non-Hazardous Materials collected for recycling or composting. Principal Project Company shall comply with all Hazardous Material regulations, including, but not limited to, the following:

1. Universal Wastes shall be stored in containers so that they do not spill, leak, break, or are released into the environment.

2. Label or mark universal wastes, or their containers, to identify their types.

3. Send all universal waste to a facility authorized to collect, recycle or dispose of universal waste.

4. Do not dispose of universal waste in the trash.

5. Do not accumulate more than 5,000 kilograms of Universal Waste at any one time.

6. Train employees in proper Universal Waste management including handling, packaging, storing and labeling the Universal Waste, as well as how to respond to releases. This training may be accomplished by simply giving employees written instructions about Universal Waste.

7. Keep record of all shipments and receipts of Universal Waste for three years.

J. Treated Wood Waste: For complete information on handling and disposal of Treated Wood Waste (TWW), refer to the fact sheet available from the DTSC website. For incidental TWW wastes generated during construction, Principal Project Company shall comply with the following minimum requirements:

1. Keep TWW segregated from other materials.

2. Store no more than 1,000 pounds of TWW for no longer than 30 days. In the event that Principal Project Company stores more than 1,000 pounds of TWW or stores TWW for more than 30 days, Principal Project Company shall comply with additional requirements for routine generators of TWW. Refer to DTSC fact sheet.

3. Label all TWW bundle/shipments with the following information:

TREATED WOOD WASTE – Do not burn or scavenge.

TWW Handler
Name:_____
Address:_____
Accumulation Date:_____

4. Take TWW to an authorized TWW facility. See the listings at the end of the factsheet for information on facilities who have been authorized to accept TWW in California.

5. Keep records of all shipments of TWW for three years.

K. Waste Reduction: Principal Project Company shall implement waste reduction measures, including, but not limited to, the following:

1. Eliminating the procurement of unneeded supplies;

2. Reduce waste by printing and copying double-sided;

3. Submit all submittals, reports, and forms in electronic format (PDF);

4. Fully participate in available and required recycling and composting programs; and

5. Purchase products made with recycled content such as paper and recycled aggregate.

L. LEED:

1. Principal Project Company shall comply with the requirements of LEED version 4.0 MR Prerequisite Construction and Demolition Waste Management Planning.

2. The 75% minimum recovery requirement cannot include any alternate daily cover (ADC) in order to meet the requirements of LEED version 4.0 MR Credit Construction and Demolition Waste Management to earn the project 2 points.

3. Principal Project Company shall submit the following items in electronic format by uploading to the City's Waste Tracking Platform and in accordance with Paragraphs 1.5, 1.6, and 1.7 below:

a. Material Reduction and Recovery Plan.

b. Material Reduction and Recovery Monthly Summary of Recovery (Diversion) and supporting documentation.

c. Material Reduction and Recovery Final Report.

1.5 MATERIAL REDUCTION AND RECOVERY PLAN

A. Principal Project Company shall comply with the requirements under this Paragraph 1.5 for the Project.

B. Before commencement of the D&C Work at the Project Site, Principal Project Company shall prepare a Material Reduction and Recovery Plan (MRRP) to be discussed with the City. To prepare the MRRP, Principal Project Company shall conduct a site assessment to estimate the types and quantities of materials that will be generated by construction and/or demolition at the site and which materials are anticipated to be feasible and practical for reuse and recycling. .

C. Principal Project Company shall schedule a meeting with the City to discuss its proposed MRRP to develop a mutual understanding regarding the City's reuse and recycling policies and goals and their application to the Project. Principal Project Company must manage all Construction Workg and demolition debris to meet a minimum recovery rate of 75%.

1. The MRRP will be used as a submittal for compliance with the waste management plan requirements of LEED version 4.0 MR Prerequisite Construction and Demolition Waste Management Planning. The MRRP shall include any and all required information to meet the LEED prerequisite.

D. Principal Project Company shall obtain tonnage estimates for all construction and demolition debris from all Principal Project Companys and compile data from all Principal Project Companys into the MRRP. The MRRP shall include, but not be limited to, the following:

1. Principal Project Company's information and Project identification.

2. Procedures to be used for debris management.

3. A list of the materials and estimated quantities to be reused or recycled.

4. The names, locations, and permit or license, as applicable, of recycling and reuse facilities and Registered Facilities (for mixed C&D debris material) that Principal Project Company plans to use for the Project.

5. Procedures for source separation for the materials listed in subparagraph 1.4E "Recycling Requirements" of this Section.

6. Source Reduction: Describe any project practices that will reduce waste at the source, such as requiring vendors to deliver materials in reusable packaging.

7. On-site Processing: Describe procedures in which materials are reused on-site, such as grinding materials for use on-site, or reuse of lumber for concrete frames, etc.

8. Procedures to educate and train all employees and Principal Project Companys on recycling and reuse procedures to be used at the jobsite.

E. Principal Project Company shall use the City's Waste Tracking Platform to provide all MRRPs and related reports for the Project. The City will create a Green Halo project account for use by Principal Project Company. Principal Project Company shall then use this account to prepare and submit the initial MMRP following these steps:

1. Register the Project and create a project tracking number

2. Provide the MRRP (https://wastetracking.com/city/sfgov/).

3. Coordinate the MRRP with the LEED Construction and Demolition Debris Management Plan (if the Project is pursuing a LEED certification) requirements.

4. Comply with the City and County of San Francisco's requirement for a minimum 75% recovery rate from landfill.

5. Describe Principal Project Company's approach to managing the Project's construction and demolition debris.

6. When complete, click "Submit" for review and approval.

F. The MRRP is subject to approval by the City. Principal Project Company shall revise and resubmit the MRRP as required by the City.

G. Review of Principal Project Company's MRRP shall not relieve Principal Project Company of responsibility for compliance with applicable laws and regulations governing control and disposal of solid waste or other pollutants.

1.6 MONTHLY UPDATES OF MATERIAL RECOVERY

A. Principal Project Company shall provide monthly updates through the City's Waste Tracking Platform by uploading new information, quantifying the construction and demolition debris generated and reused, or recycled. Principal Project Company shall upload information regarding transporter method, recovered materials, facilities used, and weight tickets generated as well as any other applicable supporting files and additional requirements.

1.7 MATERIAL REDUCTION AND RECOVERY FINAL REPORT

A. Upon Final Acceptance of the Project, Principal Project Company shall submit a Final Recovery Report to the City's Waste Tracking Platform showing weight of all construction and demolition debris material recovered for the entire project and the overall recovery rate achieved.

B. The Final Recovery Report shall be prepared into one plan/report by Principal Project Company with data from all Principal Project Companys and submitted to the City.

1. The Final Recovery Report shall be used as a submittal for compliance with the final waste report requirements of LEED version 4.0 MR Prerequisite Construction and Demolition Waste Management Planning. The Final Recovery Report shall include any and all required information to meet the LEED prerequisite.

1.8 JOB SITE ADMINISTRATION

A. Principal Project Company shall review the environmental goals of the Project with Principal Project Companys of all tiers.

B. Principal Project Company shall make a proactive effort to increase awareness of these goals and ensure full compliance to the MRRP and LEED Construction and Demolition Debris Management Plan among Principal Project Company's employees, contractors, and other workers.

C. Principal Project Company shall communicate the presence of demolition debris which is Hazardous Material to all workers on the job site and shall establish and clearly identify Hazardous Material storage areas. Principal Project Company shall discuss practices and alternatives to minimize worker exposure to potentially harmful substances expected to be encountered on the job site.

D. Principal Project Company shall provide green, blue and black refuse bins and appropriate signs for all temporary field offices to separate recyclable and compostable materials from the trash and subscribe to adequate collection services. To subscribe to these services, contact Recology San Francisco at 415-330-1300

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 02 41 16 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of existing building.

2. Removing below-grade construction.

3. Disconnecting, capping or sealing, and removing site utilities.

4. Salvage of existing items

5. Principal Project Company's Demolition Plan.

B. Related Requirements:

1. Temporary Facilities and Controls: Section 01 50 00; for temporary construction, protection facilities, and environmental-protection measures for building demolition operations.

2. Information Sheet No. S-04 dated June 22, 2015 on the subject of Demolition Permits as published by the San Francisco Department of Building Inspection (SFDBI).

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.

B. Remove and Salvage: Detach items from existing construction and deliver them to City as directed.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Demolition Conference: Conduct conference at Project Site. Review methods and procedures related to building demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be demolished.

2. Review structural load limitations of existing structures.

3. Review and finalize Demolition Plan and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review and finalize protection requirements.

1.4 MATERIAL SALVAGE

A. The City will hand over the site in the Leave-Behind Condition.

B. Any items of interest or value to City that may be encountered during building demolition and are noted in this Agreement shall be salvaged and remain City's property.

C. Carefully remove and salvage items or objects in a manner to prevent damage and deliver promptly to City unless otherwise specified.

D. Coordinate with City any special procedures for removal and salvage.

1.5 ACTION SUBMITTALS

A. Demolition Plan as specified below.

1.6 INFORMATIONAL SUBMITTALS

A. Items enumerated under Part C of SFDBI Information Sheet No. S-04.

B. Qualification Data: For demolition firm.

C. Inventory: After building demolition is complete, submit a list of items that have been removed and salvaged.

D. Pre-demolition photographs.

E. Sustainable Design (LEED):

1. General:

a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.

b. Sustainable design submittals are in addition to other submittals.

c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:

a. Materials and Resources Credit for Construction and Demolition Waste Management: Comply with Section 01 74 50 "Material Reduction and Recovery Plan."

1.7 DEMOLITION PLAN

A. The Principal Project Company shall submit a complete Demolition Plan detailing procedures and sequence for removing the existing structures including all features necessary to remove the structure in a safe and controlled manner to insure stability of the structure at any given time.

B. Thoroughly investigate the condition of the existing structures to be removed before proceeding with the Demolition Plan.

C. The Demolition Plan shall consist of the following:

1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.

2. Interruption of utility services.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Details and locations of shields or other protective measures in sufficient numbers to ensure that people, property and improvements will not be endangered.

5. All other information as required and described in SFDBI Information Sheet No. S-04.

D. The Principal Project Company's Engineer of Record shall be present at the site as required when removal operations are in progress. Should an unplanned event occur, the Engineer of Record shall report immediately the procedure of operation to correct or remedy the occurrence. The Engineer of Record shall report in writing within 24 hours of the event the details of the event and the procedure for correction. In addition, the Engineer of Record shall include proposed procedures to eliminate similar events in the future.

1.8 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with applicable Law.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

1.9 PRECONSTRUCTION PHOTOGRAPHS

A. Before commencement of work on the site, take digital photographs of the surrounding properties from different vantage points. Coordinate vantage point locations with the City's Authorized Representative.

B. Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as cracking or other damage caused by the building demolition operations.

C. Photographs shall:

1. Provide factual presentation.

2. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

B. Digital File:

3. File Format: Joint Photographic Experts Group (JPEG), unless otherwise directed by Architect.

4. Minimum Resolution: 12 mega pixels.

5. Provide digital date/time imprint on each picture.

6. Digital images shall be exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

D. Deliver on USB flash drive or other digital means to City before work onsite begins.

E. Prints are not required.

1.10 FIELD CONDITIONS

A. Building to be demolished will be vacated and their use discontinued before start of Work.

B. Promptly repair damage caused by demolition operations to existing adjacent structures and facilities to remain at no cost to the City. If the existing finished surface of the paving of City streets is damaged, it shall be repaired to the satisfaction of the City. Corrective work shall be at the Principal Project Company's expense.

C. Hazardous Materials present in building and structures to be demolished shall be abated by the Principal Project Company under this Contract.

1.11 TRAFFIC

A. Conduct demolition operations and the removal of debris to ensure minimum interference with streets, walks, and adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

B. Existing pedestrian sidewalks shall be kept open at all times unless otherwise approved by the City.

1.12 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A. If street closure is required, comply with the provisions of Section 12, "Construction Area Traffic Control Devices," of the State of California Caltrans Standard Specifications.

B. If any component in the traffic control system is displaced or ceases to operate or function from any cause during the progress of the work, the PPC shall immediately repair said component to its original condition or replace said component and shall restore the component to its original location.

C. When a lane closure is made for work periods only, at the end of each work period, all components of the traffic control system, except portable delineators adjacent to the traveled way, shall be removed.

1.13 UTILITY SERVICES

A. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

B. Do not interrupt existing utilities serving adjacent properties.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Conduct a pre-construction survey of existing conditions and correlate the survey with requirements indicated to determine extent of building demolition and existing conditions of adjacent construction to remain. Survey shall be documented with the pre-construction photographs as specified.

B. Inventory and record the condition of items to be removed and salvaged.

C. When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to City.

D. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.2 PREPARATION

A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.

1. Arrange to shut off indicated utilities with utility companies.

2. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

3.3 PROTECTION

A. Existing Facilities: Protect adjacent walkways, buildings, and other facilities during demolition operations.

B. Temporary Protection: Erect temporary protection, such as fences and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 01 50 00 "Temporary Facilities and Controls."

1. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

2. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.

3. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.

3.4 DEMOLITION

A. General: Demolish indicated existing buildings and structures completely. Use methods required to complete the Work within limitations of governing regulations.

B. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.

1. Maintain adequate ventilation when using cutting torches.

2. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

C. Perform surveys as the Work progresses to detect hazards that may result from building demolition activities.

D. Conduct building demolition and debris-removal operations to ensure minimum interference with City streets, walks, and other adjacent occupied and used facilities.

E. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as flooding, and pollution.

F. Below-Grade Construction: Demolish foundation walls and other below-grade construction. Remove below-grade construction, including basements, foundation walls, and footings, completely.

G. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

3.5 EXPLOSIVE DEMOLITION

A. Explosives: Use of explosives is not permitted.

3.6 SALVAGED ITEMS

A. Where required by this Agreement and when so directed to be salvaged and/or reused, remove item to be salvaged in the most careful manner possible to avoid damage; and, if damaged, such items shall be restored to conditions satisfactory to the City.

B. Materials to be removed and not reused or salvaged shall become the property of the Principal Project Company, who shall be responsible for their timely removal from the Project Site and their legal disposal.

C. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to City.

4. Transport items to City as instructed.

5. Protect items from damage during transport and storage.

D. Coordinate re-installation of salvaged items into new work with Project Schedule to assure installation in the Project.

3.7 SITE RESTORATION

A. Rough grade below-grade areas ready for further excavation or new construction.

B. Completely fill voids resulting from building demolition operations that will not be required by new construction with satisfactory soil materials according to backfill requirements and recommendations of the Geotechnical Engineer.

3.8 REPAIRS

A. Promptly repair damage to adjacent construction caused by building demolition operations.

B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

C. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.9 RECYCLING DEMOLISHED MATERIALS

A. General: Separate recyclable demolished materials from other demolished materials to the maximum extent possible. Separate recyclable materials by type.

B. Provide containers or other storage method for controlling recyclable materials until they are removed from Project site.

C. Transport recyclable materials off the Project Site and legally dispose of them as specified in Section 01 74 50 (Material Reduction and Recovery Plan).

3.10 DISPOSAL OF DEMOLISHED MATERIALS

A. Except for items or materials indicated to be recycled, salvaged, or otherwise indicated to remain City's property, remove demolished materials from Project site and legally dispose of them as specified in Section 01 74 50 (Material Reduction and Recovery Plan).

B. Do not allow demolished materials to accumulate on-site.

C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

D. Do not burn demolished materials.

3.11 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION

SECTION 02 80 13 - HAZARDOUS BUILDING MATERIALS – REMEDIATION

PART 1 - GENERAL

1.1 SUMMARY

A. Many of the materials and items of equipment used to construct the improvements and facilities at the Project Site contain materials known to the State of California to be either carcinogenic or reproductive toxins. Such hazards include but are not limited to asbestos-containing materials (that are not NOA), lead based paints, lead-containing materials and demolition associated with Hazardous Materials.

B. This Section includes hazardous and toxic materials precautions, general requirements, and handling procedures as required to the work and existing conditions of the project. This Section includes requirements and procedures to be performed by Principal Project Company for the handling, removal, abatement, remediation, transportation and disposal of hazardous building materials.

C. Hazardous Materials removal shall be conducted as per the construction phasing and staging described as specified in the Contract Documents.

D. Principal Project Company shall perform all Hazardous Materials remediation work under the Contract Documents as described herein and in Section 01 35 44 Hazardous Building Materials – Scope of Work and Section 7.7 of the Agreement.

1.2 RELATED DOCUMENTS AND SECTIONS

A. Section 01 35 44 Hazardous Building Materials - Scope of Work

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. E84: “Standard Test Method for Surface Burning Characteristics of Building Materials.”

2. E849: “Practice for Safety and Health Requirements Relating to Occupational Exposure to Asbestos.”

3. E119: “Standard Method for Fire Tests of Building Construction and Materials”

B. American National Standards Institute (ANSI):

1. Z41.1-1967: “Men’s Safety-Toe Footwear.”

2. Z86.1: “Commodity Specification for Air.”

3. Z87.1-2020: “American National Standard for Occupational and Educational Personal Eye and Face Protection Devices.”

4. Z89.1: “Requirements for Industrial Head Protection.”

5. Z9.2-2018: “Fundamentals Governing the Design and Operation of Local Exhaust Ventilation (LEV) Systems”

6. Z88.2-1992: “American National Standard for Respiratory Protection.”

7. Z88.6: “Respiratory Protection - Respirator Use Physical Qualifications for Personnel.”

C. National Fire Protection Association (NFPA):

1. Standard 701: “Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.”

2. Standard 10: “Standard for Portable Fire Extinguishers.”

3. Standard 70: “National Electric Code.”

D. California Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA):

1. Title 8 California Code of Regulations (8 CCR) Section 5144 - Respiratory Protection.

2. Title 8 California Code of Regulations (8 CCR) Section 1532.1 - Lead in Construction Standard.

3. Title 8 California Code of Regulations (8 CCR), Article 4, Section 1529 - Asbestos.

4. Title 8 California Code of Regulations (8 CCR) Sections 3203 and 1509 - Injury and Illness Prevention Program.

5. Title 8 California Code of Regulations (8 CCR), Article 110, Section 5208 – Asbestos, Appendix F.

6. Title 8 California Code of Regulations (8 CCR), Article 2.5, Section 341.6 for employer registration when disturbing more than 100 sq. ft. of ACCM.

7. Title 8 California Code of Regulations (8 CCR), Section 1537: Welding, Cutting, and Heating of Coated Materials.

E. California Department of Public Health Title 17 California Code of Regulations (17 CCR) Sections 35001-36100 for Accreditation, Certification, and Work Practices for Lead-Based Paint and Lead Hazards.

F. U.S. Department of Housing and Urban Development (HUD): Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing,” referred to as the “HUD Guidelines.”

1.4 DEFINITIONS

A. Activity Class/Category - Lead: Lead hazard designations assigned to work activities that involve lead-containing materials. Activities, which fall into Classes 1 through 3, including as examples the operations defined below, are required to assume the following personal airborne exposure levels, unless otherwise demonstrated.

Lead Hazard Trigger Activities	Work Activity
Trigger Task, Activity 1 Exposure Less than 500 micrograms/m3	Surface clean-up of lead-containing dust or debris less than 15,000 microgram/square feet Spray painting with lead-based paints Manual demolition of structures (e.g. drywall, plaster, etc.) Manual sanding, grinding, needle gunning, chiseling, hammering, wire brushing, milling or scraping of lead-based coatings Heat gun removal of surface coating power tool Power tool cleaning with dust collection system
Trigger Task, Activity 2 Exposure 500 micrograms/m3 or greater but less than 2500 micrograms/m3	Using lead mortar Lead burning Rivet busting Power tool cleaning without dust collection systems Clean-up of dry abrasive Abrasive blasting enclosure movement and removal
Trigger Task, Activity 3 Exposure 2,500 micrograms /m3 or greater	Abrasive blasting of coated surfaces Welding on coated surfaces Torching or cutting of coated surfaces Torch burning of coated surfaces

B. Asbestos Work Class: Activities for removing asbestos materials by categories as follows:

Asbestos Activity Class/Category	Work Activity
Work Class I	Activity involving removal of Thermal System Insulation (TSI) and surfacing Asbestos-Containing Materials (ACM) or friable Presumed – Asbestos Containing Materials (PACM).
Work Class II	Activity involving removal of ACM which is not TSI or surfacing material, including, but not limited to, wallboard, floor tiles and sheeting, roofing and siding shingles, naturally occurring asbestos (soil, rock, etc.) and construction mastics. Note also that Class II materials that cannot be removed intact, such as soil, require usage of respiratory protection at all times, regardless of personal monitoring data showing compliance to PEL and EL.
Work Class III	Repair and maintenance operations where TSI or surfacing is likely to be disturbed, which fits within one standard glove bag or waste bag.
Work Class IV	Maintenance and custodial activities during which employees contact but do not disturb PACM or ACM and activities to clean up dust, waste bag and debris resulting from Work Class I, II, and III activities.
Unclassified	Any activities dealing with materials containing detectable but <1.0 % asbestos.

C. Certified Lead Worker: includes those who do lead-related Construction Work activities on the Project Site under the directions of a Certified Lead Supervisor, including:

1. Removal, disposal or abatement of loose and peeling lead-based paints as defined by CDPH, including scraping, demolition or other Cal/OSHA Activity 1 through 3 work as defined above.

2. Removal or repair of lead plumbing.

3. Repainting or general construction on surfaces painted with lead-based paints.

   a. Removal, enclosing or covering of lead-contaminated soils.

4. Exemption: renovations, remodeling, painting, operations and maintenance work or other activities listed above that are considered to be interim controls, or lasting less than 20 years, may be completed by workers satisfying Cal/OSHA's asbestos awareness training requirements only.

D. Certified Lead Supervisor: includes those who supervise daily work activities on a lead-related construction site, as well as supervision of repainting or general construction performed on surfaces with lead-based paints where abatement is designed to permanently reduce or eliminate lead hazards for public (non-industrial) buildings or to last more than 20 years. The Certified Lead Supervisor shall oversee the Certified Lead Workers, enforce safe work practices, and schedule and coordinate work site activities with the building occupants and other contractors and consultants.

E. Containment: as defined by the California Department of Public Health includes any system, process or barrier used to contain lead hazards in a work area, including plastic sheeting, wet scraping, and other lead-safe work practices as described in the HUD Guidelines, Chapter 8.

F. Remediation: abatement, removal, control or containment of hazardous or toxic material(s).

1.5 SUBMITTALS

A. Principal Project Company shall submit copies of any notice of safety and environmental violations received from the regulatory agencies that they may have received in the last 20 years in the USA.

B. Principal Project Company shall submit copies all the minimum qualification licensing requirements required under Section 01 35 44 Hazardous Building Materials - Scope of Work.

C. Principal Project Company shall submit proof of its five (5) years of Hazardous Materials abatement and/or removal experience asked for in Section 01 35 44 Hazardous Building Materials - Scope of Work.

D. Principal Project Company or its Hazardous Materials abatement Principal Project Company shall submit proof of its environmental training requirements asked for in Section 01 35 44 Hazardous Building Materials - Scope of Work.

E. BAAQMD-issued Approval Letter for Asbestos Demolition. "[Job Number]". For all demolition of buildings and structures, regardless of whether asbestos is present or not, Principal Project Company shall submit a copy of the BAAQMD-issued Approval Letter for Asbestos for Demolition, "*[Job Number]*" to the SAR group within the City Public Works Department prior to the start of demolition. To obtain this letter, Principal Project Company shall submit an Asbestos Demolition Notification to the BAAQMD through their web-based Online Asbestos Notification System (http://learn.baaqmd.gov/course/view.php?id=4#section-5) at least ten (10) business days prior to the start of any demolition.

F. As per Section 01 35 44 Hazardous Building Materials - Scope of Work, Principal Project Company shall submit a Hazardous Materials Management Plan (HMMP) with the following documentation listed below. The HMMP shall be submitted no later than ten Days before start of Work at the Project Site or NTP2, whichever is earlier and before commencement of demolition activities. **No hazardous materials work may start without the HMMP reviewed and approved by the SAR group within the City Public Works Department.**

G. The Hazardous Materials Management Plan (HMMP) is Principal Project Company's comprehensive plan for the management of Hazardous Materials encountered during the Work for the Project. The HMMP shall include the following Plans and information:

1. An asbestos abatement work plan.

2. A lead hazard/removal control plan.

3. A waste management plan (WMP).

4. Information about Principal Project Company's designated Project safety representative (PSR) as per Section 01 35 44 Building Related Hazardous Materials - Scope of Work, and Section 01 35 45 Health and Safety Criteria. Include his/her training certification, qualifications; his/her name, phone number; fax number, and pager number.

5. Management spill procedures in the event of asbestos or any hazardous materials release or any event that may require modification or abridgment of site control and decontamination procedures.

6. Intended methods of compliance for hazardous materials handling work, including description of engineering controls, personal protective equipment as well as compliance monitoring as applicable.

7. Schedule and sequence of work for all hazardous materials work.

8. Worksite layout diagram: Detailing location of each regulated area and construction of each containment identifying location of each decontamination units, fire extinguishers and emergency exits.

9. A copy of the Site-Specific Hazard Communication Plan in accordance with federal and California OSHA requirements.

10. Copies of required licenses, certifications and notifications to handle and control hazardous materials.

H. As part of Principal Project Company's HMMP, Principal Project Company shall submit a Waste Management Plan (WMP). The WMP is Principal Project Company's comprehensive plan for waste management of hazardous and non-hazardous waste generated during the remediation work of this project. The WMP shall include the following:

1. Information about the designated persons who will implement the plan. Include his/her name, phone number, and his/her roles and responsibilities for implementing the plan.

2. Waste segregation procedures for waste generated from demolition debris, abatement, and stabilization.

3. Proposed location of locked dumpster, if applicable.

4. Sampling plan and protocol for waste characterization in accordance with 22 CCR §66262, et. seq.

5. Handling, segregation, and waste load-out procedures for hazardous and non-hazardous waste, including TSCA-regulated waste. Include diagrams showing regulated areas for waste segregation, load-out stations, paths of travel for off-hauls of waste, and engineering controls to prevent air pollution and potential exposures to airborne contaminants.

6. Waste hauler identification, information, 24-hour contact number, and copy of licenses.

7. Asbestos and lead waste disposal sites identification. Include name, address, 24-hour contact number.

I. For Asbestos Containing Construction Materials (ACCM), or Asbestos Containing Material (ACM), as applicable by regulation, and as part of the Hazardous Materials Management Plan (HMMP) Principal Project Company shall submit the following, but not limited to:

1. Asbestos Pre-job Submittals:

a. Proof of current asbestos contractor's license issued by the California Principal Project Companys State License Board.

b. Proof of current California Department of Industrial Relations (CA-DOSH or Cal/OSHA) asbestos contractor's registration certification.

c. Valid and current Bay Area Air Quality Management District (BAAQMD) notification for the Project (as applicable).

d. Cal/OSHA 24-hour notice per 8 CCR 1529.

e. Worker documentation, including:

1) Current AHERA training certification - supervisor/competent person

2) Current AHERA training certifications for workers.

3) Respiratory fit test records within past 12 months.

4) Annual medical examination approvals for respirator use.

f. Written asbestos abatement work plan and schedule with the sequence of work.

g. Material Safety Data Sheets.

h. Emergency phone numbers, pagers and email addresses.

i. Aerosol Challenge Testing Certification

1) Aerosol challenge testing using dioctylphthalate (DOP, also known as Bis(2-ethylhexyl) phthalate) or an approved alternative is required for all equipment fitted with High Efficiency Particulate Air (HEPA) filters including negative pressure units, air machines, fan units and vacuum cleaners.

2) Prior to use, testing must be performed on site:

(a) Whenever equipment enters the site.

(b) After replacement of HEPA filters or any other significant repairs or alterations.

3) Equipment which fails testing shall be marked and promptly removed from the site.

4) Equipment which has passed testing shall be marked with a unique identifier number and the date of the testing. The identifier number shall be reflected on all testing documentation.

5) Recognized alternatives to DOP include, but are not limited to 4 centistoke (4 cSt) viscosity grade polyalphaolefin (POA) fluids such as Emery 3004 POA and selected mineral oils. Testing equipment modification and/or recalibration may be needed to use DOP alternatives.

j. Rotameter calibration data calibrated by a primary standard within past 6 months.

k. Periodic Submittals: Submitted upon request during abatement:

1) Principal Project Company's personal air monitoring results (daily)

2) Updated workers documentation (as needed)

3) Daily boundary access logs

4) Daily negative pressure manometer records (print outs), as applicable

5) Copies of updated schedules and notices to the regulatory agencies (as needed)

l. Project closeout Submittals: Within 5 calendar days upon request by the SAR group within the City Public Works Department or within 5 calendar days after completion of the abatement or hazard control work, Principal Project Company shall submit the following:

1) Copies of updated schedules and notices to regulatory agencies, as needed.

2) Receipt and weight tickets from landfill operator or incinerator, as applicable.

3) Copies of completed uniform waste manifests.

4) Certification of completion.

J. For lead-related Work, and as part of the Hazardous Materials Management Plan (HMMP) Principal Project Company shall submit the following, but not limited to:

1. Pre-job Submittals: Principal Project Company shall submit documents pertaining, but not limited, to the following:

a. San Francisco Department of Building Inspections (DBI) notification and posting requirements as deemed required for exterior paint remediation.

b. Cal/OSHA notifications as per 8 CCR 1532.1

2. Workers documentation:

a. Current CDPH lead contractor/supervisor training certificates.

b. Current lead awareness training certificates - workers or CDPH Certified Lead Workers Certificate, as appropriate.

c. Respiratory fit test records within past 6 months.

d. Annual medical examination approvals.

e. Blood lead tests within past 90 days.

3. Lead hazard/removal control plan pursuant to 8 CCR 1532.1: Procedures for minimizing and controlling the migration of lead from disturbance of lead-containing materials including a written lead hazard or lead removal work plan and schedule with the sequence of work:

4. Project close-out Submittals: Within 5 calendar days upon request by the SAR group within the City Public Works Department, or within 5 calendar days after completion of the abatement or hazard control work, Principal Project Company shall submit the following:

a. Updated worker documentation, as needed.

b. Principal Project Company periodic personal air monitoring results.

c. Receipt and weight tickets from landfill operator or recycler, as applicable.

d. Waste profiling data (TCLP, WET, and other analytical data)

K. For Copper Chromate Arsenate (CCA) treated wood related Work:

1. As part of the Hazardous Materials Management Plan (HMMP), Principal Project Company shall submit the following, but not limited to:

a. Identification of EPA-approved hazardous waste landfill disposal facility, or an EPA-approved solid waste disposal facility.

b. Temporary storage plan.

2. Workers documentation:

a. Certification of the workers and supervisor's forty (40) hour HAZWOPER training in compliance with 40 CFR 1910.120.

b. Medical examination approvals for respirator use within the past twelve (12) months, or in compliance with 8 CCR 5144.

c. Respiratory fit test records within the past twelve (12) months minimum, or in compliance with 8 CCR 5144.

3. Within 5 calendar days upon request by the SAR group within the City Public Works Department or within 5 calendar days after completion of the abatement or hazard control work, Principal Project Company shall submit the completed manifest or evidence of shipment date, recycler, and quantities shipped.

L. For fluorescent light tube related Work

1. As part of the Hazardous Materials Management Plan (HMMP), Principal Project Company shall submit the following, but not limited to:

a. Identification of EPA-approved recycler.

b. Temporary storage plan.

2. Project close-out Submittals: Within 5 calendar days upon request by the SAR group within the City Public Works Department, or within 5 calendar days after completion of the abatement or hazard control work, Principal Project Company shall submit the completed manifest or evidence of shipment date, recycler, and quantities shipped.

1.6 QUALITY CONTROL

A. Meetings

1. Pre-abatement meeting: Prior to any removal of Hazardous Materials and upon approval of the HMMP, Principal Project Company shall arrange and attend a pre-construction meeting with the SAR group within the City Public Works Department, the City's Authorized Representative, and others whose work may be affected. The meeting agenda shall include the following considerations:

   a. Weekly Meetings: At the option of the SAR group within the City Public Works Department, abatement work extending over one week in length may require attendance of Principal Project Company at a weekly progress meeting. The purpose of this meeting is to review abatement and project scheduling, coordination with other trades, security and site-specific requirements.

   b. Start-up Hazardous Materials handler's meeting: Prior to the beginning of on-site work, all Hazardous Materials handlers shall attend a pre-start-up safety meeting that addresses hazardous materials issues specific for the project.

   c. Review of the specifications and plans in detail related to the abatement and hazards control work. All conflicts and ambiguities, if any, shall be discussed.

   d. Review in detail the Project conditions, schedule, construction sequencing, site protection, protection of historic building materials abatement application requirements, and quality of completed work.

   e. Review in detail the means of protecting adjoining areas; protection of Principal Project Company's employees and contractors, City's employees and contractors, and completed work during the abatement and lead removal activities.

   f. Pre-job submittals requirements.

   g. Site security requirements.

B. Field Quality Control Sampling

1. During all asbestos-related work, perimeter sample(s) shall be collected by the City's Certified Industrial Hygienist or its environmental consultant (DOSH Certified Asbestos Consultant). These sample(s) shall be analyzed by Phase Contrast Microscopy (PCM). Sample results that are in excess of the background level or 0.010 fibers per cubic centimeter (f/cc) Project Action Level may be forwarded for analysis by Transmission Electron Microscopy (TEM) with a 12-hour turnaround specified. Handling, shipping, and analysis charges (including the Environmental Consultants time and expenses) shall be paid for by Principal Project Company. Any sample results in excess of 70 asbestos structures per square millimeter of filter area (corrected for a 1,200 - 1,800 liter sample volume as appropriate, or in excess of 0.018 str/cc, normalized to a 1,500-liter air sample) shall require cleaning, inspection, and resampling of the affected area at Principal Project Company's expense.

2. During all lead-related work, such as demolition, torching and welding activities, etc., as applicable, visual inspections, perimeter air sample and/or lead wipe sample results shall be collected by the City's Certified Industrial Hygienist or its environmental consultant

(DOSH Certified Asbestos Consultant). These samples shall be analyzed by flame atomic absorption.

C. Clearance and Re-occupancy Sampling

1. Asbestos Clearance Sampling

a. Clearance samples will be collected by the SAR group within the City Public Works Department or their designee at the completion of the asbestos abatement activity. Clearance will be either by visual inspection and/or phase contrast microscopy (PCM) and/or aggressive air sampling - transmission electron microscopy (TEM). The City reserves the right to conduct AHERA clearance criteria and limit the number of samples for clearances to be less than AHERA protocol when the City deems appropriate.

b. Clearance air samples using aggressive air sampling techniques shall be collected for all abatement zones, unless otherwise designated in the Contract Documents.

c. Phase Contrast Microscopy (PCM) Clearances: Areas cleared by PCM shall show an airborne concentration of total fibers for each sample at or below 0.010 fibers per cubic centimeter (f/cc) using the NIOSH 7400A counting rules. Any sample result exceeding 0.010 fibers/cc shall require re-cleaning of the work area and retesting. The City as Regulator will determine the minimum number of samples, based on the quantity and types of materials removed configuration, and sequencing of the work areas, and similar considerations.

d. When transmission electron microscopy (TEM) clearances are conducted, as designated by the Contract Documents, analysis shall be conducted by using the method described in 40 CFR Part 763, Appendix A, Subpart E (AHERA), with an analysis turn-around time of 24 hours, unless otherwise designated by the City as Regulator. Z-test requirements under the AHERA regulations shall **NOT** apply to the Project. The TEM clearance standard is 0.018 s/cc for **ALL** samples (equivalent to 70 s/mm^2 for a 1500-liter sample volume). The City as Regulator may opt to adjust the sample volume to prevent possible overloading of the samples from interference dusts (e.g., demolition, welding particulates), if so, the analytical sensitivity shall be at or below 0.005 s/cc, maintained by having adequate number of grids analyzed by the laboratory.

2. Lead Wipe Sampling

a. All areas with regular occupancy affected by disturbance, demolition or scraping of painted surfaces shall be cleared by wipe sampling. Lead wipe sampling will be collected immediately prior to area occupancy.

b. The SAR group within the City Public Works Department or its designee will collect clearance wipe samples after approving the work area cleanliness based on visual inspection. The wipe samples will be collected from building surfaces, NOT from plastic sheeting or other temporary barriers. Principal Project Company shall re-clean the area if surface lead concentrations exceed any of the following HUD definitions for lead contaminated dust:

1) <10 micrograms/ft^2 for interior floors

2) <10 micrograms/ft^2 for interior horizontal surfaces other than floors

3) <100 micrograms/ft^2 for exterior floor and horizontal surfaces, window sills and troughs

c. All reoccupancy/clearances will be based on floors and any interior horizontal surfaces. Routine use of other levels is not expected and are for use only as determined by the City as Regulator on a case by case basis. Areas that do not meet the HUD lead contaminated dust criteria shall continue to be cleaned by Principal Project Company at its expense until the specified criteria is achieved. Only after passing re-occupancy clearance, shall Principal Project Company teardown the containment and demobilize.

d. Where lead remediation occurs concurrently with asbestos remediation activities, the area may be cleared (in addition to the wipe samples) by aggressive air sampling, where airborne lead concentrations following the final visual inspection shall not exceed the EPA's NAAQS standard of 1.5 micrograms/m^3 as analyzed by NIOSH method 7082 (flame atomic absorption) or 7105 (graphite furnace atomic absorption) or ICP/MS.

D. Final Clearance Criteria

1. The City will pay the cost of the final round of visual inspections, aggressive air sampling, and PCM and/or TEM analyses that will meet the asbestos abatement specification. All rounds of visual inspections, aggressive air sampling, and PCM and/or TEM analyses that fail to meet the contract criteria shall be borne by Principal Project Company. For the purpose of this paragraph, visual inspection includes the area isolation inspection, pre-encapsulation inspection, and final area clean-up inspection.

2. If wipe sampling for re-occupancy clearance fails the HUD lead contaminated dust criteria, Principal Project Company shall be responsible for additional clean-up costs until clearance is achieved.

3. Principal Project Company shall pay for all environmental consultant costs for delays in completion of work beyond the Project Schedule. Such charges shall include consultant's observations and inspections, daily air monitoring, equipment, transportation and analysis charges. Such costs are estimated at $1,200 per day, exclusive of any costs associated with final clearance air testing.

E. Inspections

1. Work Area Inspections: Inspections are required at the completions of the following job phases:

a. Pre-cleaning inspection(s)

b. Work area preparation inspection (Pre and post 24-hour hold times)

c. Pre-encapsulation inspection

d. Final visual inspection

e. Waste handling inspection

2. Principal Project Company shall provide in writing a signed or initialed request for inspection to the SAR group within the City Public Works Department. Request all inspections at least 24 hours in advance of the time required; inspections shall be performed between the hours of 8:00 a.m. and 3:00 p.m., Monday through Friday, unless otherwise noted. Written requests may be waived, and verbal requests accepted for short-duration projects at the discretion of the SAR group within the City Public Works Department. Adequate lighting is to be provided by Principal Project Company.

3. Precede all inspection requests by an evaluation by the Construction Manager, who shall verify that criteria for acceptability have been met prior to requesting an inspection.

4. Pre-cleaning Inspection:

    a. The SAR group within the City Public Works Department or its designee shall inspect all surfaces requiring pre-cleaning to verify that dust and debris have been removed and cleaned up to an acceptable condition. Multiple inspections may be required to cover all systems and the required phasing of activities.

    b. No object shall be covered until inspected or approved by the SAR group within the City Public Works Department or its designee as stated in the requirements herein. When covered before such inspections are made and approved, Principal Project Company shall uncover such work for inspection, subsequently restore it, and replace work of others damaged thereby, all at Principal Project Company's expense.

5. Work Area Preparation Inspection:

    a. After preparing the work area and decontamination enclosure system(s) for Activity Class I and II work areas, as applicable, the SAR group within the City Public Works Department or its designee shall conduct an initial inspection to ensure completeness of work and type containment according to the specifications.

    b. No hazardous material removal work shall commence without the approval of the SAR group within the City Public Works Department following a work area preparation inspection.

6. Pre-Encapsulation Inspection:

    a. After detail cleaning has been completed and the Principal Project Company has checked and approved the area as adequately cleaned, the SAR group within the City Public Works Department or its designee shall inspect all surfaces requiring encapsulation to verify that hazardous materials have been removed and the area and abated surfaces leaned to an acceptable condition.

    b. During such inspections, Principal Project Company shall provide adequate lighting, ladders, scaffolding, workers, etc., so as not to curtail the systematic inspection of all surfaces by the SAR group within the City Public Works Department or its designee. Areas requiring rework shall be tagged in a manner to allow continuation of the inspection in a timely manner. The SAR group within the City Public Works Department or its designee shall not be expected to remain within an area requiring extensive re-cleaning.

    c. The pre-encapsulation inspection may be staged to allow inspection of detailed surfaces concurrent with the removal activities in adjoining areas ready for inspection, allowing a buffer zone to protect against cross-contaminating inspected surfaces. For lead removal: a final overall inspection shall be required to reconfirm the final wipe down of all horizontal surfaces, which may have been subjected to contamination from airborne releases during the staged inspection process. The staging of inspections shall not preclude Principal Project Company from conducting internal quality control inspections prior to requesting review by the SAR group within the City Public Works Department or its designee.

7. Final Visual Inspection: After the encapsulation process is complete, the encapsulant is dry, and all debris bags, tools, supplies, and equipment have been removed from the work area, as applicable, the SAR group within the City Public Works Department or its

designee shall inspect the work area to verify the cleanliness of the area, including but not limited to public and attic areas. The work area must be free of visible debris, dust, water, or loose and peeling lead-based paints as a minimum.

8. Waste Handling Inspection: The SAR group within the City Public Works Department or its designee shall inspect waste as it leaves the regulated area. Principal Project Company shall insure that all waste is packaged, labeled, and handled as required. The SAR group within the City Public Works Department or its designee may inspect the waste dumpsters at any time, including prior to transportation. Principal Project Company shall coordinate temporary relocation to a transport staging area with the SAR group within the City Public Works Department or its designee prior to removal.

1.7 ADDITIONAL CONTRACT REQUIREMENTS

A. Specific mandatory asbestos abatement requirements for *occupied and unoccupied spaces* at San Francisco sites are more stringent than current regulations. This summary of additional requirements is not to be read as a stand-alone document.

1. If work procedures are going to change, the SAR group within the City Public Works Department and the City's Authorized Representative must be notified, in writing, and given the opportunity to notify surrounding employees as the new procedures may impact surrounding areas (e.g., noise, vibration).

2. Localized occupants must be notified in writing of limited access to the work areas prior to the start of project.

3. Principal Project Company is responsible for coordinating with the SAR group within the City Public Works Department as to where the exhaust air is to be directed and to ensure the exhausted air will not be recirculated within the facility prior to the initial setup of the work area.

4. A rigid and robust secondary perimeter with "Caution Construction" sign or equivalent. The secondary perimeter shall be a full height, 1-hour fire-rated, dust and sound proof construction barricade as per the architectural drawings for the Project.

5. The regulatory signage is to be posted between the secondary construction perimeter and the regulated work area.

6. All equipment shall be inspected by the SAR group within the City Public Works Department or its designee prior to being brought into the hospital. All equipment and supplies shall be free of dust and debris.

7. On-site aerosol challenge testing of negative air machines and HEPA vacuums prior to start of work and every 90 days for longer projects, when machines are relocated between floors. The aerosol challenge testing shall be conducted in the work area.

8. Sufficient quantities and types of dehumidifier units shall be installed and operated within the construction area to reduce humidity levels to 40% relative humidity.

9. Method of sealing critical barriers including the capping of ducts, supply registers, etc. shall be dust tight and capable of withstanding air flow and pressure generated by the ventilation system. Tape and/or polyethylene sheeting alone shall not be used to seal the supply registers.

10. Negative pressure differential of -0.04 inches of water with manometer reading records is required for all areas at all times during abatement and general construction activities.

Downgrading of negative pressure during construction may be considered on a case by case basis.

11. The negative pressure enclosure shall maintain the minimum Negative pressure differential of -0.04 inches of water for at least 24 hours prior to the start of abatement unless otherwise approved by the SAR group within the City Public Works Department. Following 24-hours, the SAR group within the City Public Works Department and its environmental consultant will review the containments to determine if the integrity of the containments has been maintained. The Containment will have passed when the following 3 conditions are met:

    a. Containment integrity has been maintained for at least 24-hours; and

    b. Negative pressure has been maintained at least at -0.04" w.g. for 24-hours; and

    c. The SAR group within the City Public Works Department and the environmental consultant are satisfied that the containment has been constructed sufficiently so as to last for at least two months without modifications, repairs or improvements.

12. In negative pressure enclosures, a calculated air exchange rate of no less than 10 air exchanges per hour for the entire area in which the renovation activities are being performed.

13. Installation of clear, transparent view ports made of plastic or equivalent, in the polyethylene wall so that activities can be visually monitored from outside the containment. This window shall measure approximately 1' wide by 2' high. It shall remain transparent throughout the duration of the abatement process. It is recognized that viewing ports are not possible in all situations.

14. Adhesive tack ("sticky") mats with multiple layers shall be installed at all construction barricade entrances to prevent tracking of construction dust outside of the construction area.

15. The removal of debris shall be in tightly covered containers, and only at times and routes approved by the SAR group within the City Public Works Department and facility personnel.

16. All HEPA equipment, tools, decontamination chambers, etc. shall be clean upon entering the Project Site. Typically, the equipment and materials are inspected at a loading dock prior to bringing them into the facility. NOTE: The use of decontamination showers is limited to Class I work only unless otherwise specified by the abatement work plan.

17. Principal Project Company is responsible for ensuring that water is properly shut off at lavatory/faucet fixtures at the beginning and ending of each shift.

PART 2 - PRODUCTS

2.1 GENERAL

A. Prohibited Materials

1. Mastic or paint removers shall not result in the generation of hazardous waste.

2. Cleaning agents, equipment, and methods employed shall not in any way damage the substrate or adjoining surfaces and finishes which are to remain. Cleaning solvents shall be non-injurious to the surfaces upon which they are applied. The methods used shall cause no pitting, erosion or damages to the surfaces.

3. Paint removal chemicals may not attach or leave deposits on the substrate material.

4. The following tools and equipment are specifically prohibited unless accepted in writing by the SAR group within the City Public Works Department:

   a. High- or low-pressure water-blasting equipment for hosing of ductwork or work areas.

   b. Gasoline, propane, diesel or other fuel powered equipment inside the building.

5. Equipment that creates excessive noise or vibration that would affect safety of the building or its occupants or generate complaints from the occupants. Equipment shall not exceed an A-weighted sound level of 85 dB as measured at 50 ft. from the radiating source.

6. Asbestos-containing materials shall not be disturbed by cutting, sawing, grinding, pulverizing, crumbling, breaking, or otherwise rendered friable or airborne unless these activities are conducted under the requirements of all applicable regulations and guidelines by trained certified workers.

B. Minimum Requirements:

1. Deliver all materials in original packages, containers, or bundles bearing the names of the manufacturers and the brand names and details for proper storage and usage. Store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient to prevent damage or contamination. Store materials so as not to interfere with Project Site operations.

2. Do not use damaged or deteriorating materials. Remove damaged materials from the premises. Dispose of contaminated materials in accordance with applicable regulations.

2.2 MATERIALS AND EQUIPMENT

A. Principal Project Company shall ensure that following materials and equipment shall be available on the Project Site:

B. Protective Devices: Temporary wash stations or showers, disposable clothing, respirators, gloves, hard hats, and other required items. Respirators shall protect against appropriate dusts, fumes and mists as approved by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH) under provisions of 30 CFR Part 11.

C. Waste Receptacles: Conform to federal and State regulations, with 6-mil minimum thickness waste bags.

D. Polyethylene Sheeting and Dust Barriers

1. Polyethylene sheeting shall be flame-retardant and approved and listed by the State Fire Marshal in accordance with Section 13121 and/or 13144.1 of the California Health and Safety Code.

2. Thickness and Size: 6-mil thick minimum, unless otherwise specified, sized to minimize the frequency of joints.

3. Flammability: Comply with NFPA Standard 701 with a flame spread rating of no greater than 5 and a smoke development rating of no more than 70 when tested in accordance with ASTM accordance with ASTM E84 procedures.

E. Protective Devices to conform to the following:

1. Polyethylene drop cloths and dust barriers, temporary wash stations or showers, disposable clothing, respirators, gloves, hard hats, and other required items.

2. Respirators shall protect against asbestos and other appropriate dusts, fumes and mists as approved by the National Institute for Occupational Safety and Health (NIOSH) under provisions of 30 CRF Part 11.

F. Sealants:

1. Sealants shall, at a minimum, conform to the following:

a. Shall be Fire resistant

b. Shall be compatible with concrete, metals, wood, cable jacketing and other materials capable of preventing fire, smoke, water and toxic fumes from penetrating through sealants.

c. Shall be asbestos free and shall have a flame spread, smoke and fuel contribution of zero.

d. Shall be ASTM- and UL-rated for 3 hours for standard method of fire test for fire stop systems.

2. Spray adhesives shall not contain methylene chloride or methyl chloroform (1,1,1-trichloroethane) compounds.

3. Adhesive tape shall comply, at a minimum, with the following.

a. Must be 2" or wider, shall be capable of sealing joints of adjacent sheet of polyethylene and attaching polyethylene sheet to finished or unfinished surfaces of similar materials.

b. Tape shall be capable of adhering under dry and wet conditions, including use of amended water. Complete taping to critical or sensitive surfaces utilizing preservation sealing tape, such as:

1) 3M Scotch Brand No. 4811 Preservation Tape; or

2) 3M Scotch Brands No. 472 Plastic Film Tape.

G. Surfactants and Encapsulants:

1. Wetting agents or surfactants shall be effective and compatible with the ACM being wetted.

2. Bridging or penetrating type encapsulants shall have the following characteristics:

a. Water based. Do not utilize an organic solvent in which the solid parts of the encapsulant are suspended.

b. Non-flammable with no methylene chloride.

c. U.L. listed encapsulants, in full-scale ASTM E119 fire test, compatible with W.R. Grace “Retroguard, RG-1” fireproofing with “Spatterkote” Type SKII” bonding treatment for structural and decking widths exceeding 24 inches.

d. Compatible with replacement materials, especially mastics, fireproofing, and adhesives.

H. Mastic and Paint Removers to conform to the following:

1. Non-flammable solvent or gel, with a flash point above 140 degrees Fahrenheit.

2. Of low odor type.

3. Solvent waste shall not result in the generation of hazardous waste as described under 22 CCR, Division 4.

4. Removers shall NOT contain methylene chloride, halogenated hydrocarbons, or any of the following glycol ethers:

Common Name	**Abbreviation**	**CAS #**	**Chemical Name**
Ethylene glycol methyl ether	EGME	109-86-4	2 - methoxyethanol
Ethylene glycol methyl ether acetate	EGMEA	110-49-6	2- methoxyethyl acetate
Ethylene glycol ethyl ether	EGEEA	111-15-9	2- ethoxyethanol
Ethylene glycol dimethyl ether	EGDME	110-71-4	1,2-dimethoxyethane
Ethylene glycol diethyl ether	EGDEE	629-14-1	1,2 - diethoxyethane
Diethylene glycol	DEG	111-46-6	2,2 - dihydroxyethyl ether
Diethylene glycol methyl ether	DEGME	111-77-3	2-(2-methoxyethoxy) ethanol
Diethylene glycol ethyl ether	DEGEE	111-90-0	2- (2-ethoxyethoxy) ethanol
Diethylene glycol dimethyl ether	DEGDME	111-90-6	Bis-(2-methoxyethoxy) ether
Triethylene glycol dimethyl ether	TEGDME	112-49-2	2,5,8,11-tetraoxadodecane
Dipropylene glycol	DPG	110-98-5	2,2 - dihydroxyisopropyl

I. Vacuums and Negative Pressure Units (NPUs) used for cleanup of materials and detailing shall be HEPA-filtered, clean, without significant dents, marring, or otherwise unprofessional appearance. Coordinate with the Environmental Consultant for inspection and approval prior to bringing this equipment into a building. Conduct DOP testing on-site in the presence of the City as Regulator's environmental consultant for all HEPA-filtered units.

J. Air filtration devices shall, at a minimum, conform to the following:

1. Filtration devices shall be high efficiency particulate absolute (HEPA) filtration systems bearing a UL 586 label indicating its ability to perform under specified conditions. Filters shall be marked with the name of the manufacturer, serial number, airflow rate efficiency and resistance, and the direction of the test airflow. Provide units with two stages of pre-filtering, as follows:

a. A low efficiency type first stage pre-filter for particle sizes 100 micrometers and larger.

b. A medium efficiency type second stage pre-filter effective for particle sizes down to 5 micrometers.

c. Pre-filters installed either on or in the intake grid to the exhaust unit and held in place with special housings or clamps.

2. HEPA-filtration exhaust units are to include:

a. An elapsed time meter showing the total accumulated hours of operation.

b. An electrical interlock preventing operation of the unit without a HEPA filter.

c. An automatic shutdown system to stop the fan in the event of a rupture in the HEPA filter or a blocked air discharge.

d. Warning lights to indicate normal operation (green), moderately high pressure drop across the filters, such as due to filter overloading (yellow), and too high of a pressure drop due to an overloaded or ruptured HEPA filter or obstructed discharge (red).

e. An audible alarm if the unit shuts down due to operation of the safety systems.

f. Electrical components approved by the National Electrical Manufacturers Association (NEMA) and the Underwriter's Laboratories (UL). Each unit shall be equipped with overload protection sized for the equipment. Properly ground the motor, fan, fan housing, and cabinet.

g. A cabinet constructed of steel or aluminum capable of withstanding damage from rough handling and transportation, with a width under 30-inches to fit through a standard-size doorway, mounted on casters or wheels.

h. Several spare HEPA-filtered exhaust units on-site to be used as needed if active units fail.

K. Waste Containers:

1. Waste receptacles to conform to federal and State regulations, with 6-mil minimum thickness or glove bags or waste bags.

2. Sealable drums shall be of 30- or 55-gallon capacity constructed of fiber or metal with tightly fitting lids for hazardous waste disposal. Label the drums and bags in accordance with U.S. EPA and local air quality management district requirements, including the Generator I. D. number or location identification, and manifest number. Provide air and watertight drums. If previously used, the drums shall be food grade and shall be approved by the City as Regulator prior to their storage or use on-site. Sealable polyethylene bags shall be of 6-mil minimum thickness for asbestos disposal. Size bags to fit within drums specified above.

L. Cleaning Agents:

1. Cleaning agents, equipment, and methods employed shall not in any way damage the substrate or adjoining surfaces and finishes. Cleaning solvents shall be non-injurious to the surfaces upon which they are applied. The methods used shall cause no pitting, erosion or damages to the surfaces.

2. Do not use chemicals that may attach or leave deposits on the substrate material. Modify the process or processes to suit the finish, hardness, and condition of the surface to be cleaned.

PART 3 - EXECUTION

Principal Project Company shall:

3.1 EXAMINATION

A. Review Hazardous Materials reports and information and ensure the information is available to all contractors and trades working on the Project Site.

B. Promptly notify the SAR group within the City Public Works Department of differing conditions or for suspected materials not identified or listed under Section 01 35 43.

C. Notify the SAR group within the City Public Works Department, in writing, a minimum of 48 hours in advance of any planned disturbances to any Hazardous Materials or prior to performing any Hazardous Materials abatement.

D. Disturbance of asbestos or lead and other Hazardous Materials, including demolition, surface preparation, or removal of paint, can contaminate air, soil, and water surrounding the Project Site. It is the responsibility of Principal Project Company to evaluate and determine the most appropriate level of containment necessary to prevent the uncontrolled release of Hazardous Materials from the work site.

E. As per Cal/OSHA regulatory requirements, establish the required site controls, class of containment, of ventilation, and of air monitoring as appropriate for the removal means and methods as selected to perform the specific removal work. These systems shall be sufficient to control exposures to workers, the public, and to protect the surrounding environment.

3.2 PREPARATION

A. Protective Procedures and Workers Protection

1. Protect Visitors and Other Site Personnel: Cordon off the Hazardous Materials removal and hazard control area(s) with appropriate signs, and provide temporary tunneling or scaffolding, as applicable.

2. Provide site security to assure that no member of the public or any unqualified or untrained person is able to gain access to any Hazardous Materials work area at any time while maintaining open access and egress routes at all times.

3. Provide worker training, respiratory protection, and medical examinations to meet applicable regulations.

4. Provide temporary lighting and power to work areas, including installation of ground fault interrupters as required. Ensure that all electrical power is terminated in the work area, and ensure, among others, outlets and lights are disconnected and cannot be re-energized during the course of the Work. Fully ground all equipment within the work zone and decontamination assemblies.

5. Construct enclosure system(s) for worker and equipment decontamination.

6. Establish negative pressure in work area(s) as required under 8 CCR Section 1529. Follow and follow hazard control procedures as outlined under Cal/OSHA regulations CCR 1532.1 and CDPH regulations 17 CCR Sections 35001 through 36100.

7. Provide workers with sufficient sets of protective full-body clothing to be worn in the designated work area and whenever a potential exposure to lead, asbestos, and hazards exists. Such clothing shall include but not be limited to full-body coveralls, headgear, eye

protection, and gloves. Disposable-type protective clothing, headgear, and footwear may be provided.

8. Respiratory Protection: Comply with Cal/OSHA Regulations included in 8 CCR Sections 1529, 1532.1 and ANSI Standard Z88.2, "Practices for Respiratory Protection: Workers shall wear appropriate respiratory protection during lead, asbestos and any other hazards work, unless negative exposure assessment testing verifies that employee exposures are below the PEL or Action levels.

B. Site Protective Controls:

1. Locate temporary scaffolding and dust barriers, as required, and proceed with the construction or demolition, allowing for continued operation of any adjacent occupied areas, as applicable.

2. Erect temporary protective covers over pedestrian walkways and at points of passage for persons or vehicles, which are to remain operational during the work.

3. Where life safety systems shall be made non-operational, coordinate shutoff with SAR group within the City Public Works Department. Protect all wiring associated with the system.

4. Air Filtration Device

a. Differential air pressure systems for each work area to be in accordance with Appendix J of the EPA's "Guidance for Controlling Asbestos-Containing Materials in Buildings," EPA 560/5-85-024.

b. Minimum work area differential air pressure of -0.025 inches w.g. at all times when required, including during the removal, gross clean-up, waste transfer, and encapsulation activities. Account for fluctuations of the negative pressure by aiming for a higher-pressure differential at the project outset to ensure that the chances of the pressure differential dipping below -0.025 inches w.g. are minimal.

c. Provide sufficient number of units for each work area to maintain differential air pressure in the work area at -0.025 inches w.g. between the work area and adjacent non-work areas at all times, allowing for stack and thermal effects. Locate unit(s) so that the primary make-up air enters the zone through the decontamination facilities and traverses the work area as much as possible, unless otherwise approved by the SAR group within the City Public Works Department.

d. Provide on-site certification of all HEPA-filtered negative pressure units to document adequate filtration efficiency for all units exhausting internally within the building or as otherwise required by the SAR group within the City Public Works Department. Systems shall be certified by a third-party to conduct onsite dioctylphthalate (DOP) or Portacount challenge testing, signed by an independent tester or Principal Project Company's Site Safety Representative. DOP testing shall verify an in-situ efficiency of 99.97% or greater. Portacount testing shall verify an in-situ efficiency of 99.3% or better.

5. Exhaust Air:

a. Establish negative pressurization within the work area exhausting air ducted through temporary panels located in window frames or exterior doorways. Such panels must be designed to prevent rainwater from entering the work area.

b. Unless otherwise directed by the SAR group within the City Public Works Department, Principal Project Company shall replace any windows removed at the

completion of Hazardous Materials removal work. Vent exhaust air to the exterior of the building at locations approved by the SAR group within the City Public Works Department unless otherwise noted or directed.

c. Do not locate exhaust outlets near or adjacent to other building intake vents or louvers or at the entrances to the building. Do not exhaust air into the building interior spaces or within 50 feet of the building's supply air intakes, unless otherwise noted or directed by the SAR group within the City Public Works Department.

6. Decontamination Enclosure Systems

a. Construct a decontamination enclosure system (as a minimum) in accordance with OSHA Regulation 29 CFR Part 1926.1101 and Cal/OSHA Regulation 8 CCR Sections 1529 and 1532.1. The systems shall be contiguous to the work area consisting of three totally enclosed chambers and airlocks. Mobile isolation enclosures shall be permitted in areas where space limitations shall not permit such construction.

b. For Work Class I, II and III work areas, provide, at a minimum, a two (2)-stage decontamination assembly, including an equipment and contiguous clean room with bucket wash-up facilities. A shower will be required if the work is greater than 25SF.

c. Post all emergency phone numbers, notifications, emergency exiting diagrams and procedures, as required.

d. Post danger signs at the entrance to all decontamination units, per OSHA Regulation 29 CFR Part 1926, 1529 and 1532.1.

e. The SAR group within the City Public Works Department must approve location of decontamination enclosure systems prior to commencing Construction Work.

f. Mobile isolation enclosure(s) shall be constructed of rigid frames (either 2 x 4-inch wood construction or PVC tubing, as appropriate) and polyethylene sheeting or rigid plexiglas sheets. Do not tape, nail, puncture or disturb asbestos containing building materials to attach, or secure the mini enclosure system.

g. No eating, drinking, smoking, or chewing gum or tobacco is permitted in or near the asbestos or lead work areas or decontamination enclosure systems except in areas designated by the SAR group within the City Public Works Department. Smoking will not be permitted in the clean room and near storage or usage areas of flammable materials, such as spray adhesive and mastic removers.

3.3 ASBESTOS ABATEMENT PREPARATION

A. Notifications:

1. Notify the SAR group within the City Public Works Department, in writing, a minimum of 48 hours in advance of any asbestos-abatement work.

2. Notify, in writing, the BAAQMD at least 10 working days prior to commencement of any asbestos project equal or greater than 100 linear feet (LF) or more than 100 square feet (SF) or 35 cubic feet or more of regulated asbestos-containing materials. Obtain a job number.

3. Notify Cal/OSHA a minimum of 24 hours in advance of any disturbances of any amount of friable or non-friable asbestos-containing materials or prior to performing asbestos-related work.

4. Advise Project Safety Representative of suspect conditions. Do not remove or disturb suspect materials until tested and approved by the SAR group within the City Public Works Department or its designee.

B. Prohibited Activities:

1. Asbestos-containing materials shall not be disturbed by cutting, sawing, grinding, pulverizing, crumbling, breaking, or otherwise rendered friable or airborne unless these activities are conducted under the requirements of all applicable regulations and guidelines.

2. Only a registered Asbestos Abatement Principal Project Company per Cal/OSHA regulation 8 CCR 1529 shall complete Work exceeding 100-sq. ft. or 100 linear feet or 35 cubic feet of asbestos-containing construction materials.

C. Demolition of non-ACM obstructing known intact ACM:

1. Remove non-contaminated and non-asbestos materials for access using standard dust control procedures as required for painted assemblies and construction housekeeping controls.

2. Minimize disturbances to substrates concealing friable or damaged asbestos-containing materials, such as laid-in ceiling tiles concealing asbestos-containing fireproofing, demolition of non-ACM partitions which may destabilize sprayed-on asbestos-containing acoustical finishes, etc. Qualified workers shall conduct work impacting asbestos-containing materials.

D. Unexpected exposure to known or suspect Asbestos-Containing Material (ACM):

1. Where ACMs are discovered intact, such as intact pipe lagging, proceed to cordon off the affected area and immediately post it with a “caution” sign to prevent unintentional disturbances. Immediately alert Principal Project Company’s site safety representative of the conditions for proper removal and disposal procedures.

2. Where ACMs are damaged or suspect asbestos contaminated conditions are encountered, discontinue work in the immediate suspected area, shutdown the area’s HVAC system, if not already disengaged, and alert Principal Project Company’s site safety representative of the conditions for proper removal and disposal procedures.

E. Unexpected release of asbestos into the environment:

1. Cordon off the immediate area (10 to 20 ft. radius minimum), and shutdown the area’s HVAC system (if applicable).

2. Notify the City’s Authorized Representative and the City Environmental Health and Safety Department immediately.

3. Notify Principal Project Company’s site safety representative for proper removal and disposal using wet methods and HEPA-filtered vacuums. Clean-up work shall be completed under the directions of a Asbestos Competent Person with 16-hour minimum EPA operations and maintenance asbestos training and by workers with 2-hours asbestos awareness training minimum unless exposures exceed the permissible exposure limit (PEL) of 0.1 fibers/cc.

4. Decontaminate or dispose of friable waste in double 6-mil thick goose necked labeled waste bags for manifesting and disposal.

F. Work area set up and protection:

1. Principal Project Company shall carry out the following:

a. Pre-Cleaning

1) Work Areas: Pre-clean surfaces in workspace. If the space has any contamination in the opinion of the SAR group within the City Public Works Department, then Principal Project Company shall install air locks and negative pressure system prior to pre-cleaning.

2) Fixed Objects: Pre-clean all fixed objects within the proposed work areas using HEPA filtered vacuum equipment and/or wet cleaning methods, as appropriate. Enclose with a layer of 6-mil polyethylene sheeting sealed with tape unless specified otherwise.

3) Ductwork: Pre-clean and wrap all active and inactive ductwork within the zone with a minimum of two layers of 6-mil polyethylene sheeting sealed with tape, unless otherwise directed by the SAR group within the City Public Works Department.

4) Removable Objects: Pre-clean removable objects within the proposed work areas exposed to friable ACM or debris using HEPA filtered vacuum equipment and/or wet cleaning methods, as appropriate. Properly remove and dispose of objects from work area before abatement operations commence.

5) Work area surfaces or items scheduled to remain covered with polyethylene sheeting during the clearance air sampling shall be inspected and approved by the SAR group within the City Public Works Department upon completion of pre-cleaning before critical barriers are erected or any other removal procedures are initiated.

6) Principal Project Company shall inspect all of its equipment and shower pans that it brings to the work site before and after its use and ensure that such equipment is not contaminated.

b. Critical Barriers

1) Seal off all openings, including but not limited to corridors, doorways, ducts, grilles, diffusers, pipe chases, drains, grates, and any other penetrations of the work areas, with 6-mil polyethylene sheeting sealed with tape. Use caulking where necessary to ensure a complete seal.

2) Except for emergency exits, doorways, which will not be used for passage during work, must be sealed by first applying tape over the gap between the closed door and the doorframe and the gap between the bottom of the door and the floor. Then apply 6-mil polyethylene sheeting over the door and seal it with tape to the wall and to the floor.

3) Seal windows by applying two layers of 6-mil polyethylene sheeting sealed independently to the wall with tape.

4) HVAC registers and returns shall be sealed with metal or rigid plastic covered by polyethylene sheeting. Polyethylene sheeting is not an acceptable alternative.

5) At any time during the abatement activities after barriers have been erected, if visible suspect dust is observed outside of the work area or if the barriers are damaged, work in the abatement area shall immediately stop. Repair the barriers, and clean-up debris/residue using appropriate HEPA vacuuming and wet cleaning procedures before work recommences.

c. Regulated Work Area Isolation and Controls

1) Establish a pressure differential of -0.025 inches w.g. with manometer reading records. Submit manometer readings daily or upon request.

2) Conduct DOP testing of the HEPA-filtered negative pressure units and vacuum cleaners on site.

3) Install a transparent view port per work area for inspections.

4) Notify the SAR group within the City Public Works Department for changes in work practices immediately to allow the City the opportunity to notify and prepare the surrounding properties if the new procedures may impact the surrounding areas (due to noise, vibration, etc.).

5) Use a calibrated manometer to monitor the negative pressure, and provide the manometer print out to the SAR group within the City Public Works Department or designee at the end of the work shift.

d. Full Isolation Work Areas - Sequence of Major Events

1) This subsection outlines the sequence of events only. Modify the sequence as required if the work area is considered contaminated or if demolishing ACM or non-asbestos materials is required for access to the required abatement materials. Refer to other applicable sections of this specification for detailed requirements.

2) Cordon off the area with appropriate signs.

3) Deactivate HVAC system, unless otherwise noted or directed.

4) Protect or remove carpeting, if present, as appropriate. Contaminated carpeting will require decontamination by steam cleaning or disposal, as directed by the SAR group within the City Public Works Department.

5) Pre-clean work area, as necessary.

6) Establish temporary power and lighting.

7) Construct critical barriers.

8) Construct decontamination enclosure systems. All work areas shall contain a worker decontamination enclosure system and an equipment decontamination enclosure system, unless otherwise noted or directed.

9) Erect 6-mil polyethylene sheeting on the walls, windows, ceiling and floor, as applicable.

10) Establish negative pressure within the work area.

11) Request and facilitate a second work area preparation inspection from the SAR group within the City Public Works Department or designee following demolition and preparation of the final critical barriers, where applicable.

12) Remove ACM employing wet cleaning methods, HEPA vacuuming and proper work practices.

13) Clean-up work area.

14) Dispose of asbestos-containing waste.

15) Work area final clean up.

3.4 HAZARDOUS MATERIALS REMOVAL PROCEDURES FOR CONTROLLED RENOVATION

A. Principal Project Company shall have in place controlled renovation procedures for installation of anchors and minor disturbances to Asbestos- Containing Material under one hundred square feet (<100 SF) or under one hundred linear feet (<100 LF), except thermal system insulation (TSI) or surfacing materials (including but not limited to vinyl floor tiles, carpet or tile mastics, transite board, sheetrock wallboard, ceiling tile mastics) and carry out or comply with the following:

1. Minor work affecting non-friable materials, such as drilling molly anchors into wallboard or seismically bracing equipment through asbestos-containing may be completed by trained construction workers or maintenance personnel following procedures under the General Industry Asbestos Standards, 8 CCR 5208. All operations and maintenance procedures and personnel training records must be pre-approved by the SAR group within the City Public Works Department or its designee or prior to commencement of activities.

2. Demarcate the area of exposure to minimize traffic within the area and to protect persons outside the area from airborne asbestos exposures, even if a negative exposure assessment has been produced.

3. Assemble equipment and supplies, including but not limited to a Hudson sprayer, an HEPA- filtered vacuum, polyethylene drop cloths and wetted sponges.

4. Install a drop cloth below the area to be disturbed on the floor and other surfaces and shoot or drill the anchor through the wetted sponge or cut the material through a wetted sponge, as applicable. HEPA vacuum the area following all work and place the sponge and debris into a sealed plastic disposal bag. Do not use these procedures on asbestos-containing thermal system insulation (TSI) or asbestos-containing surfacing materials, such as asbestos fireproofing or acoustical sprayed-on plaster finishes.

5. Immediately clean up all debris dislodged from coring or drilling through asbestos and trace asbestos substrates using a wetted sponge and HEPA vacuum. HEPA vacuum the area immediately following completion of the controlled renovation procedures. Dispose of the debris as non-friable asbestos waste. Contamination of the site by use of improper procedures will require extensive clean-up and clearance air sampling by the City as Regulator, at Principal Project Company’s expense.

6. The following materials are classified as not “surfacing” materials for controlled renovation purposes involving anchoring or minor disturbances:

    a. Vinyl Floor Tiles: Cordon off the room or area and remove the floor tiles before drilling through the concrete or wooden substrate. Vinyl floor tiles can be removed using heat or manual means such as hand scrappers. Where tiles cannot be

removed in advance of coring, saturate the tile with shave cream and core through the tiles, frequently wiping up all chips and debris and disposing as Category 1 non-friable waste. Wet wipe with a clean sponge and HEPA vacuums the area upon completion of work. Seal off the area below the core capture any debris that can fall into the ceiling plenum or crawl space below.

b. Carpet Mastics: Cordon off the room or area and cutout the carpeting and mastics using a carpet knife, saturating the carpet with water to prevent airborne asbestos fiber releases. Remove excess mastics using a mastic remover with a flash point greater than 140 deg. F., as approved by the SAR group within the City Public Works Department or designee. Dispose of the carpet segment and mastics as Category 1 non-friable waste. Wet wipe and HEPA vacuum the area following completion of the controlled renovation procedures.

c. Vinyl Floor Tile Mastics: Cordon off the room or area and remove the mastics using a mastic remover with a flash point greater than one hundred and forty degrees Fahrenheit (>140 deg. F.), as approved by City. Dispose of the mastic and rags as Category 1 non-friable waste. Wet wipe and HEPA vacuum the area following completion of the controlled renovation procedures.

d. Transite Board and Mastics: Cordon off the room or area and remove the board intact, where feasible, following installation of drop cloths below. If removal is not feasible, drill through the board using the shaving cream methods described.

e. Sheetrock Wall or Ceiling Board: Shoot or drill anchors through a wetted sponge, where feasible, or use a Hilti-brand rotohammer drill equipped with a spring-loaded local exhaust hood connected to a HEPA-filtered vacuum cleaner. Cordon off the room or area and cut holes for receptacles or other devices using drop cloths on the ground and wet methods. Remove the sheetrock avoiding the joint compounds, where feasible. Continually wet the controlled renovation area during the process and wet wipe and HEPA vacuum the area following completion of the controlled renovation procedures.

f. Thin-Layered Asbestos-Containing Paints: Shoot or drill anchors through a wetted sponge or use a Hilti-brand rotohammer drill equipped with a spring-loaded local exhaust hood connected to a HEPA-filtered vacuum cleaner, where feasible. Cordon off the room or area and core using drop cloths on the ground and wet methods. Continually wet the controlled renovation area during the process and wet wipe and HEPA vacuum the area following completion of the controlled renovation procedures. Dispose of the paints as Category 1 or 2 non-friable wastes as determined by the substrate's composition.

g. Linoleum Backing: Cordon off the room and work area and cutout the linoleum, using a carpet knife prior to coring. Wet the backing using water and shave cream and remove the asbestos containing backing intact. Dispose of debris as friable asbestos waste. Wet wipe and HEPA vacuum the area of the controlled renovations for final clearance. Do not allow linoleum on cores to fall into the ceiling plenum or the space below, as applicable.

7. Other Non-Friable Materials: Complete controlled renovation procedures in compliance with Cal/OSHA's Work Class 2 procedures per 8 CCR 1529.

8. A Cal/OSHA & DOSH registered, and licensed Asbestos Abatement Principal Project Company shall complete work equal or greater than one hundred square feet (100 SF) or one hundred linear feet (100 LF) or asbestos-containing construction materials or other work as required in the Abatement Work Plan.

B. Principal Project Company shall implement controlled procedures for installation of anchors or coring through friable asbestos materials, including but not limited to sprayed-on or troweled-on acoustical plasters, structural fireproofing, and linoleum backing (as applicable), and carry out the following:

1. Avoid contact with friable ACM where practical. Anchor to non-ACM materials where feasible.

2. Install drop cloths on the ground and use a glovebag or mini-containment constructed of 6-mil polyethylene sheeting to contain work affecting friable materials.

3. Wet the ACM with water and remove limited material as required for installations. Immediately clean up all debris and seal the waste in a double 6-mil disposal bag for disposal as asbestos waste.

C. When conducting core drilling through ACM, Principal Project Company shall:

1. Assemble equipment and supplies, including but not limited to Hudson sprayers, nylon brushes, HEPA vacuums, labeled polyethylene disposal bags, approved encapsulant, duct tape, 5-in-1 tools, plastic buckets, etc.

2. Coordinate exact location of the core hole, marking the location on the underside of the structure. Spray material to be disturbed with an approved penetrating encapsulant, restricted to the area of removal and disturbance only.

3. Remove asbestos-containing materials following set-up of the isolation area under full isolation procedures or glove bag removal procedures.

4. Cordon off the area with appropriate signs and deactivate the HVAC systems, as appropriate.

5. Isolate the area with a mini-containment and decontamination assembly, and pre-clean and wrap fixed items and surfaces, as appropriate. Establish a mini-containment and decontamination assembly in the floor below.

6. Establish negative pressure within the mini containment.

7. Begin coring from the floor above, protecting against water seepage or spraying near active electrical or telephone equipment. After coring is complete, double bag, and encapsulate the raw edges of the cored hole with an approved penetrating encapsulant.

8. Clean up any residual debris and insert a non-conductive sleeve into the hole, extending 6-inches minimum below the asbestos coating. Properly secure the sleeve and seal the openings around the circumference with a fire-rated caulking or seal.

9. Dispose of ACM waste and proceed with the final work area clean up and inspection.

D. With respect to hanger installation, Principal Project Company shall:

1. Assemble equipment and supplies, including but not limited to Hudson sprayers, nylon brushes, HEPA vacuums, labeled polyethylene disposal bags, approved encapsulant, duct tape, 5-in-1 tools, plastic buckets, etc.

2. Lightly wet the material with an approved penetrating encapsulant, using a 5-gallon bucket lined with a plastic bag as a catch basket during the installation of the hanger or anchor. Cut an appropriately sized hole in the bottom of the bucket for the anchor grip to reach through. Place the plastic bag in the bucket, and with one hand, push the bottom of the anchor through the hole in the bucket sandwiching the plastic bag between the

anchor and the gun grip. Locate the anchor location and push the bucket tight against the material before setting the anchor. Carefully lower the bucket and the gun and dispose of the waste gathered in the bag and any loosened materials.

3. As an alternative to the above procedures, lightly wet the material with an approved encapsulant, placing a 3" x 5" sponge dampened with encapsulant against the material. Shoot the anchor or drill through the sponge so that any localized loosened material is trapped between the sponge and substrate. Leave the sponge in place, removing any signs of loose or dislodged debris. Re-spray any loosened materials with an approved encapsulant, restricted to the area of the disturbance.

4. Clean-up the immediate area using wet methods and a HEPA vacuum. Dispose of friable plasters, linoleum backing, fire proofing and thermal system insulation as friable asbestos waste.

E. With respect to coring on Fireproofing and Textured Acoustical Plasters, Principal Project Company shall:

1. Cordon off the area and set-up negative pressurization of the controlled renovation activity using glovebag or mini-containment methods. Do not drill or core openly through friable ACM. A Certified Asbestos Worker only under Cal/OSHA Work Class I or III procedures, as applicable shall complete such work. Wet the materials throughout the controlled renovations. Do not allow ACM on cores to fall into the ceiling plenum or Crawl Space below. Following the controlled renovation activities, clean up the mini containment using wet methods and a HEPA vacuum. Gooseneck and dispose of the glovebags, where applicable, within a double waste bag.

F. Principal Project Company shall work within crawl spaces, confined spaces, or plenums with *Thermal System Insulation (TSI): Control Renovation Procedures for Friable Asbestos Materials*, and carry out the following:

1. Core or anchor through adjoining non-ACM materials, where feasible. If not feasible, cordon off the area and set-up negative pressurization of the controlled renovation activity using glovebag or mini-containment methods per 8 CCR 1529.

2. Do not drill or core openly through friable ACM. Wet the materials throughout the controlled renovations. Do not allow ACM on cores to fall into the ceiling plenum or Crawl Space below. Following the controlled renovation activities, clean-up the mini containment using wet methods and a HEPA vacuum. Gooseneck and dispose of the glovebags and waste in double goose necked bags as friable asbestos waste.

3. Adhere to all the requirements for confined spaces as follows:

a. It is the responsibility of Principal Project Company to provide all equipment and assistance to make the confined space safe for entry by Principal Project Company's employees, the City, the City as Regulator, and its representatives in accordance with the California Code of Regulations, Title 8, General Industry Safety Orders entitled "Confined Spaces."

b. If any activities associated with confined space entry become necessary, Principal Project Company shall be required to consult the City as Regulator for guidance and prepare an appropriate Permit-Required Confined Space Entry Plan.

G. For asbestos-containing sheetrock and joint compound, Principal Project Company shall:

1. Lightly spray the material to be disturbed by spot removal, drilling, etc., with an approved penetrating encapsulant, restricted to the area of disturbance only. For anchoring into

ACM, locate the attachment location and push an encapsulant-wetted sponge between the stud or joist and the existing sheetrock before setting the anchor. Carefully shoot the anchor or drill through the stud or joist and sponge, and HEPA-vacuum any loosened materials or debris. For small-scale removals, penetrate the material with care, using a sharp utility knife or other appropriate tools, removing the encapsulated section and catching it directly into a lined bucket or waste disposal bag, where feasible, disposing of as asbestos waste. HEPA-vacuum the edges of the remaining materials and re-encapsulate the friable edges of the remaining sheetrock with penetrating encapsulant. Do not disturb materials beyond the limited scope of work.

3.5 HAZARDOUS MATERIALS REMOVAL PROCEDURES

A. When removing asbestos-Containing Thermal System Insulation (TSI), Principal Project Company shall carry out or comply with the following:

1. Set-up a full isolation containment or a secondary containment for all glovebags abatement areas. Install critical barriers with two layers of polyethylene sheeting on the floors and on the walls. Set up a full decontamination system with shower for quantities greater than 25 LF, unless otherwise directed by the Contract Documents.

2. Areas with evidence of damaged TSI will require HEPA-vacuuming of the access to this debris as well as vacuuming of all piping, ductwork and substrate materials within a minimum five (5) ft. radius of all such contamination.

3. Use wet methods and HEPA vacuums. The removal of TSI shall be sufficient to accommodate access by applicable trades within the plenum, wall cavity or crawl space zone for routing of conduit, cables, etc. Coordinate with abatement of other applicable materials.

4. Pipe Insulation Removal: Cut and separate metal bands, where appropriate. Locate the section length (typically three feet) and cut around the circumference at the end of the attached section. Twist the section to ensure it is free from the pipe. Using an airless sprayer, saturate the exterior of the covering with amended water to limit fiber release. Locate the upper and lower half seam and position one seam at the top of the pipe. After positioning, cut along the length of the section and carefully open each half. Immediately saturate the exposed inner surface thoroughly with amended water. Lower both halves into 6-mil polyethylene disposal bags. Do <u>not</u> place or allow insulation to fall on the floor. Pick-up debris falling on the floor and place it in disposal bags immediately. Clean to remove all debris remaining on the pipe.

5. Fitting Insulation: Saturate fitting insulation with amended water. Remove fitting insulation using scraping tools, hand pressure and brushing. Immediately saturate the exposed inner surface thoroughly with amended water. Do not remove insulation by striking or chipping the surfaces. Deposit fitting insulation directly into 6-mil disposal bags. Do not place or allow insulation to fall on the floor. Pick-up debris falling on the floor and place it in disposal bags immediately. Clean to remove all debris left on fitting.

6. At a minimum, use glove bags procedures as per Cal/OSHA Regulation 8 CCR 1529, Asbestos Activity Class/Category - Work Class I when removing Asbestos – Containing Thermal System Insulation (TSI) materials.

7. Disassemble the pipping tanks and mechanical component on the boiler and heater systems using wet methods. Saturate the packing ACM before removing the bricks, pipes, and other ACM insulated (tar paint, canvas, materials.

8. Dispose of TSI and packing material in double goose necked-labeled bags or double wrap cutout sections in 6-mil polyethylene sheeting and properly labeled as friable asbestos waste.

B. With respect to removing friable insulation, fireproofing, acoustical plaster, and, laid-in, splined or glued-on acoustical tiles, Principal Project Company shall comply with the following:

1. Mist asbestos material with amended water, using airless sprayers, or spray equipment recommended by the surfactant manufacturer and capable of providing a "mist" application to reduce the release of fibers. Saturate the material sufficiently to wet it to the substrate without causing excessive dripping or de-lamination of the material. Mist the asbestos material continuously during work process to maintain damp conditions and to minimize asbestos fiber dispersion, but without accumulating water on the floor.

2. Remove ACM and overspray from all surfaces, including but not limited to structural steel, deck, walls, ceilings, ducts, insulation, piping, conduit, junction boxes, cables, etc.

3. Remove the saturated ACM in small sections. As it is removed, place the material in sealable plastic bags. Do not allow materials to dry out prior to insertion into the bags. Do not permit materials to accumulate on floors and other surfaces in the work area.

4. After removing the ACM, wet and wipe all surfaces, or use a soft-bristle brush to remove all residual accumulated material. Clean all surfaces with special emphasis on the top edge of the Spray-Poly or polyethylene covers.

C. With respect to removing asbestos floor coverings, Principal Project Company shall comply with the following:

1. Mastic removal solvents, procedures, and equipment information submittals must be approved prior to floor coverings removal.

2. In flooring areas where a solvent-based mastic remover is to be applied, Principal Project Company shall use a low odor mastic remover. Principal Project Company shall submit the Safety Data Sheets (SDS) of the mastic remover it intends to use, for the review and approval of the SAR group within the City Public Works Department or designee. After the application of a solvent-based mastic remover, Principal Project Company shall rinse the flooring areas by wet-moping, applying “simple green cleaner” or equivalent, scrubbing floors, and finalize the clean up by re-moping with clean water. Principal Project Company shall provide adequate ventilation to exhaust out the odors from the solvent-based mastic remover. Principal Project Company shall ensure that no odors from the solvent-based mastic remover remain.

3. Vinyl floor tiles adhering to old non-ACM linoleum or tiles may require removal of the sub flooring intact to remove the overlying asbestos-containing mastic residues. For demolition projects, remove leveling compounds under VAT and non-VAT removal areas as asbestos containing unless otherwise noted.

4. Use an approved mastic removal solvent following the manufacturer's recommended procedures. Wipe residual material and dispose of waste and rags in a proper manner.

5. Where removing the mastic is feasible without the use of solvents, use water with liquid dishwashing detergent (1 ounce of detergent to 1 gallon of water), and scrub surfaces as required to remove residual material, scraping the wetted surface with a stiff-bladed wall or floor scraper. Wipe residual material and dispose of rags as ACM waste. Wet vacuum standing water with a HEPA vacuum.

6. Use of an approved portable shot abrasive "bead blaster" system that strips, cleans, and etches the floor, shall follow the manufacturer's recommended procedures. This method can dislodge sprayed-on fireproofing and/or sprayed-on acoustical plasters on the floor below due to excessive vibrations, where applicable. Therefore, adhesion and cohesion testing of these materials shall be conducted prior to the bead blaster's use. Usage of this system will require a variance from Cal/OSHA and the local Air Quality Management District as a "dry removal" method and approval by the SAR group within the City Public Works Department.

7. Use of a buffer for mastic removal will require wet buffing only. Using a buffer will render the mastic onto a friable state. Principal Project Company shall conduct mastic removal using a buffer following the BAAQMD Regulation 11, rule 2. Buffer brushes shall be disposed of after each use as asbestos waste. Thoroughly remove all mastic residues from the buffer before removal from the work area.

D. With respect to removing vinyl floor tiles and mastics, Principal Project Company shall comply with the following:

1. Remove the flooring and mastics as indicated on the Contract Drawings using full isolation procedures, satisfying the requirements of Cal/OSHA Regulation 8 CCR 1529, Work Class II.

2. Set-up critical barriers and splash guards and establish negative pressurization.

3. Remove the tiles using wet methods to minimize breakage and airborne fiber releases.

4. Remove the mastic using an approved mastic remover.

5. HEPA vacuum the contained area following abatement for clearance.

6. Provide a full decontamination system with shower for areas exceeding 25 SF.

7. Dispose of tiles and mastic as Category 1 wastes.

E. With respect to removing linoleum flooring and mastic, Principal Project Company shall comply with the following:

1. Remove the flooring and mastics as indicated on the Contract Drawings using full isolation procedures, satisfying the requirements of Cal/OSHA Regulation 8 CCR 1529, Work Class II and BAAQMD Regulation 11, Rule 2.

2. Set-up critical barriers and splash guards and establish negative pressurization.

3. Remove the linoleum backing using wet methods to minimize breakage and airborne fiber releases.

4. Remove the mastic using an approved mastic remover.

5. HEPA vacuum the contained area following abatement for clearance; minimize use of encapsulant on substrates to be retiled.

6. Provide a full decontamination system with shower for areas exceeding twenty-five square feet (>25 SF).

7. Dispose of linoleum backing and mastics as friable asbestos waste.

F. With respect to removing electrical/Wiring Insulation, Principal Project Company shall comply with the following:

1. Remove wiring by cutout of the conduit in manageable sections, where possible. Otherwise, pull the wire through the conduit with a properly sized sponge wetted with encapsulant tied to the distal end, misting the insulation continually and HEPA vacuuming any residual debris. Avoid unnecessary cutting or peeling.

2. Clean up the area and dispose of the asbestos-containing waste. Wire bundles may be wrapped in burlap or cardboard, prior to bagging, to protect against penetrating the disposal wrapping.

G. With respect to removing tar-coated electrical wrap, Principal Project Company shall comply with the following:

1. After confirming that the systems have been de-energized, including the proper deployment of log out/tag out procedure, remove materials using full isolation or mini-containment procedures, satisfying the requirements of Cal/OSHA 8 CCR 1529 Work Class 2 procedures. Use wet methods for dust controls. Dispose of materials as non-friable asbestos waste.

H. With respect to removing ACM paint of ceiling plasters, Principal Project Company shall comply with the following:

1. Remove materials using full isolation or mini-containment procedures, satisfying the requirements of Cal/OSHA 8 CCR 1529 Work Class 2 procedures. Use wet methods for dust controls. Dispose of materials as non-friable asbestos waste. Remove substrates as required to access materials and overspray.

2. Removal of larger ceiling segments, particularly demolition of elements that may impact paint finishes (see Demolition Plans), shall be completed under full isolation or mini-/mobile containment procedures by a licensed abatement contractor. The asbestos contractor using glovebag and mobile mini-containment methods or full isolation methods, depending on the quantities impacted, shall complete coring greater than two (2) inch diameter, which cannot be properly controlled using a wetted sponge.

3. If a mobile containment is used, clean-up and reseal the phone booth-type containment and airlock entry between uses.

I. With respect to removing window and door glazing compounds, Principal Project Company shall comply with the following:

1. Remove windows and doors following abatement of other interior finishes and materials and wrap in a double layer of polyethylene sheeting, where feasible.

2. Where complete removal and disposal of the frames is not feasible, scrape the glazing compound following installation of polyethylene drop cloths under each window or door.

3. Scrape residual compounds from wood or metal frames, as applicable. Double bag and dispose of materials as Category I non-friable waste unless otherwise directed by the SAR group within the City Public Works Department or designee.

J. With respect to removing exterior/perimeter windows and door caulking, Principal Project Company shall comply with the following:

1. Cordon off the work area, installing critical barriers at the windows, doors, and other penetrations, as applicable.

2. Remove ACM using wet methods per Cal/OSHA Regulation 8 CCR 1529, Work Class II.

3. Set-up drop cloths on the ground and nearby objects to contain falling materials on the ground or public access areas surrounding the work area.

4. HEPA vacuum the sills and frames following abatement.

5. Provide a full decontamination system with shower for areas exceeding 100 sf.

6. Remove residual caulking from perimeter stucco, wood, metal, window and doorframes and concrete finishes, as applicable. Double bag and dispose of materials as Category I non-friable waste.

K. With respect to removing roofing material, Principal Project Company shall comply with the following:

1. Seal any air intakes, operable windows, and skylights within 50 feet of the work area with 6-mil polyethylene sheeting secured in place over the opening. Weather conditions shall be dry and wind conditions less than 10 mph with dry. Establish a secured waste storage area where sealed bags of roofing material are stored during removal. Provide such areas for each different roof elevation or section. Line the storage areas with a layer of 6-mil polyethylene sheeting.

2. Employees and authorized visitors at the work site during on-going work shall wear approved respirators and full body disposable protective clothing as described in “Personnel Protection” and are required to fully shower out when exiting the abatement zone.

3. Set-up drop cloths on the ground under roofing removal area and abate the roofing materials using wet methods. Seal rooftop vents, windows, etc. with one layer of 6-mil polyethylene sheeting as a critical barrier. Bag or wrap waste in 2 layers of 6-mil polyethylene sheeting and lower to ground. Debris chutes must be sealed and negatively pressurized, if used.

4. Comply with the following Cal/OSHA requirements:

   a. Adequate wet ACM per 8 CCR 1529 Para. (g)(B)(2).

   b. Provide continuous misting of cutting machines per 8 CCR 1529 Para. (g)(B)(3).

   c. Use HEPA vacuums or dust collectors during power cutting per 8 CCR 1529 Para. (g)(B)(4).

   d. Do not throw ACM roofing off the roof per 8 CCR 1529 Para. (g)(B)(5).

5. For Disposal & Cleanup: HEPA vacuum the surrounding area following the abatement for final clearance. Dispose of all roofing debris as Category 1 non-friable asbestos waste.

6. Allow for a 20 ft. minimum buffer zone between the roof removal activities and other demolition or renovation work. Dampen the roof surface with a fine spray of amended water before proceeding with removal. Keep roofing material damp throughout the removal process.

7. Double bag roofing material in 6-mil labeled disposal bags and dispose of by methods described herein. Do not drop bags from the roof to the dumpster; transport bags without risk of their integrity utilizing the stairs or a lined waste chute. Where a lined waste chute is used, contain the opening to the dumpster with polyethylene sheeting and install a HEPA-filtration device to scrub the dumpster containment in the event of a bag rupture. Clean and seal the chutes overnight, as applicable.

8. HEPA vacuum and/or wet wipe the entire work site including adjacent roof area and removed areas following the roofing's abatement. The area may be sprayed with a light coat of encapsulant to lockdown all remaining asbestos fibers, except the skylights, as applicable.

9. Provide a full decontamination system with shower for areas exceeding one hundred square feet (100 SF).

10. Non-friable asbestos roofing material is considered non-hazardous and can be disposed of as non-hazardous asbestos waste. This can be transported and disposed of at a landfill-accepting Category I, non-friable ACM.

L. With respect to removing window glazing putty, Principal Project Company shall:

1. Set up the lead hazard control regulated areas. Ensure that drop cloths extend sufficiently, about ten (10) ft. minimum, in all directions.

2. Remove the windows intact to avoid disturbance to the window glazing putties. Burrito-wrap and dispose of windows as Category 1 non-friable waste. Where full removal intact is not feasible, close and seal windows and scrape putty utilizing drop cloths and wet methods. HEPA-vacuum the sills and surrounding area and use drop cloths, before final visual clearances.

M. Window and Door Glazing Compounds

1. Remove windows and doors following abatement of other interior finishes and materials and wrap in a double layer of polyethylene sheeting, where feasible.

2. Where complete removal and disposal of the frames is not feasible, scrape the glazing compound following installation of polyethylene drop cloths under each window or door.

3. Scrape residual compounds from wood or metal frames, as applicable. Double bag and dispose of materials as Category I non-friable waste unless otherwise directed by the SAR group within the City Public Works Department or designee.

N. With respect to removing fire rated doors, Principal Project Company shall:

1. Remove fire doors with 45-minute or greater fire rating intact, burrito-wrap in two (2) layers of six (6) mil fire-retardant polyethylene sheeting and dispose as friable asbestos waste.

O. With respect to removing lead – containing ceramic tiles: Principal Project Company shall:

1. Set up the lead hazard control regulated areas. Seal vents, windows, etc., with one layer of six (6) mil polyethylene sheeting as a critical barrier. Post signs.

2. Remove the ceramic tiles off from the substrate without bashing, cutting, grinding, or pulverizing the glaze, or include the ceramic tiles as part of the substrate demolition, if applicable. Bashing, cutting, grinding, or pulverizing glazed ceramic tiles is known to create significant airborne lead above the PEL.

3. Manually demolish ceramic wall tiles using drop cloths, wet methods, and HEPA vacuums for dust control in compliance with Cal/OSHA regulation 8 CCR 1532.1. Do not use power tools or airline tools to demolish ceramic wall tiles.

4. Avoid dry sweeping. Clean-up all work areas before leaving the site daily.

5. For tiles mounted to concrete, plaster or masonry substrates, isolate the room and establish negative pressurization of the work areas using HEPA-filtered negative pressure units and demolish the tiles using a pneumatic or electric chipper or jackhammer. Continuously mist the work area during chipping activities.

6. Dispose of debris as hazardous waste is waste characterization determines the waste to be hazardous. HEPA vacuum the fine debris and dust residues and dispose as hazardous waste.

P. With respect to removing lead sheeting, Principal Project Company shall:

1. Set up a negatively-pressurized containment for removal of the sheeting. Seal vents, windows, etc., with one layer of six (6) mil polyethylene sheeting as a critical barrier. Post signs.

2. Remove lead sheeting intact by unscrewing panels from substrate. Doors with sandwiched lead sheeting shall be removed by the pins/hardware without disturbance to the sheeting within the core.

3. If unbolting panels cannot be performed, and cutting of sheeting is required, non-powered tool shall be used. Lead sheeting is relatively soft and pliable, manual tearing / cutting can be easily done. Absolutely no torching or welding on the lead sheeting or in the vicinity of the lead sheeting, until after the zone has been tested, cleared and released as a non-lead containment work zone.

4. Use wet methods and HEPA vacuums for dust control in compliance with Cal/OSHA regulation 8 CCR 1532.1. Do not dry sweep any dust or debris generated by removal of panels.

5. Wrap sheeting to prevent it from scratching and leaving score marks on the floor. Lead sheeting waste shall be rolled up and wrapped with 10-mil plastic sheeting, labeled, before taken out of the containment. All scuff marks left by the lead sheeting on any surfaces must be thoroughly scrubbed and cleaned.

6. Characterize and dispose of sheeting and debris as potentially hazardous waste.

7. HEPA vacuum debris daily for all work areas before leaving the site.

8. Triple wash all surfaces inside the containment prior to final lead wipe sampling by the Environmental Consultant.

Q. With respect to removing painted plaster ceiling/wall/column lead paint removal, Principal Project Company shall:

1. Provide ladders, scaffolding, etc., to access and remove paint and or paint/substrate from all surfaces, as applicable. Ceilings shall be scraped first in each area.

2. Remove materials at applicable locations. Wet wipe, as required. Lightly dampen the work surface and mist the surrounding area continuously throughout the scraping process.

3. Scrape and nylon brush decorative or rough ceiling surfaces or trusses, as applicable, to remove the paint and or paint/substrate. Then, HEPA vacuum these surfaces.

4. After scraping, HEPA vacuum all surfaces to remove any remaining dust.

R. With respect to exterior paint removal, Principal Project Company shall:

1. Place drop cloths on the ground surrounding surfaces to catch any debris from scraping lead-based coatings, as applicable.

2. Erect temporary protective covers over pedestrian walkways and at points of passage for persons or vehicles, which may remain operational during the course of the paint removal.

3. Protect glass, metal trim and attachments, polished stone, or other sensitive materials and finishes from contact with chemical paint removers by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape. Apply masking agent to comply with the manufacturer's recommendations. Do not apply liquid masking agent to painted or porous surfaces, or masonry, as applicable.

S. With respect to steel/metal/piping spot removal, Principal Project Company shall:

1. Remove paints on steel components scheduled for welding or torching using a chemical stripper, needle gun or other approved methods as outlined in the approved Principal Project Company’s Hazardous Materials Management Plan (HMMP).

2. Use drop cloths, polyethylene barriers, Hudson and airless sprayers and other methods as required for dust control.

3. Characterize and dispose of paints, rags, etc., separately for possible disposal as a Hazardous Waste.

T. With respect to removal of surface coatings with power tools, Principal Project Company shall:

1. Where mechanical removal of surface coatings constitutes a Level II activity, provide power tools, to the extent feasible, with local HEPA exhaust or dust collector systems to capture the aerosolized lead.

a. Removal with power blasting tools: For steel coated structures and as approved by the SAR group within the City Public Works Department or designee, power blasting tools may be used for removal of the lead-based paint or hazardous coating materials. To the extent a containment construction will be required to emissions. As part of the HMMP a detailed work plan including an enclosure system with dust collection systems and exhaust ventilation as needed shall be submitted and approved by the SAR group within the City Public Works Department prior to using this method.

b. Removal with power washing: For industrial facilities or where otherwise approved by the SAR group within the City Public Works Department or designee, power washing may be used for removal of the lead-based paint or contamination. Use of this method requires construction of containment, water collection system, a filtering system, and proper disposal of the wastewater. Adequately protect adjoining sensitive materials and equipment from damage or inclusion within the lead abatement waste. Deactivate electrical systems or adequately protect them prior to the power washing. A detailed work plan including an enclosure system shall be submitted and approved by the SAR group within the City Public Works Department prior to conduct such activities.

c. Removal with Sodium Bicarbonate Blasting: For areas requiring complete removal of all coating residues, use of sodium bicarbonate blasting may be used to supplement scraping or chemical stripping. Use of this method requires construction of containment and filtering system to segregate activities and waste from active work areas. Adequately protect adjoining sensitive materials and equipment from damage or inclusion within the lead abatement waste. Deactivate

electrical systems or adequately protect them prior to the water and sodium bicarbonate blasting. A detailed work plan including enclosure shall be submitted and approved by the SAR group within the City Public Works Department prior to such activities.

U. With respect to removal of lead containing jacketed telephone cable, Principal Project Company shall comply with the following:

1. Removal, handling and disposal of lead jacketed telephone cables that may be encountered during demolition activities shall be conducted in accordance with the Cal/OSHA's Construction Lead Standards 8 CCR 1532.1 and CDPH Regulation 17 CCR Section 3500 through 36100. This includes, isolation controls, personal protective procedures and dust controls.

2. Prevent dust generated from trimming, cutting and otherwise manhandling lead sheathed telephone cables, dust from deconstructing and hauling off outmoded equipment and dust from soldier waste deposited on floors.

3. Isolate and remove in its entirety each cable designated for removal. Use appropriate equipment and work practices to prevent lead releases. If at all feasible remove the cables using hand electrical shear tools with local HEPA exhaust or dust collector systems to capture the aerosolized lead. To further minimize lead dust during the cutting, apply isolation materials such as foam or "Vaseline" in the entire area of the cutting.

4. Segregate, containerize, and characterize the electrical cables for waste disposal.

V. With respect to removal of transite wall and ceiling board, Principal Project Company shall:

1. Remove transite board using wet cleaning methods and HEPA vacuuming. Avoid unnecessary sawing and breakage. Take out as whole sheets, if possible. Remove debris remaining at the nails, screws, or other attachments to the studs and joists. Scrape residue remaining on studs or joists flush with the surface of these materials, if these materials are not scheduled for demolition. Continually mist the air with an airless sprayer or Hudson sprayer to lockdown suspended particulate.

2. Clean up debris from pipe insulation, fireproofing, acoustical insulation, or other sources (as applicable), which may exist on the topside of the studs or within the wall or ceiling cavity.

3. Clean up the area and dispose of the asbestos-containing waste. Panels may be wrapped in burlap or cardboard, prior to bagging, to protect against penetrating the disposal wrapping.

W. With respect to removal of transite pipelines, ducts, breechings, or flues, Principal Project Company shall:

1. Remove using full isolation procedures satisfying the requirements of Cal/OSHA Regulation 8 CCR 1529, Work Class II.

2. Remove transite materials using wet cleaning methods and HEPA vacuuming. Avoid unnecessary sawing and breakage. Take out as whole lengths, if possible, cutting at the hanger supports and wrapping the separated sections in a double layer of polyethylene sheeting. Note that water penetration of this material is usually minimal.

X. With respect to removal of underground transite piping or pipe insulation, Principal Project Company shall comply with the following:

1. Carefully excavate the areas identified for the underground utility or with potential to encounter underground piping. Using wet methods mist the excavated areas, as the pipe gets uncovered. To the extent feasible provide an enclosure for removal as required to control airborne fibers.

2. Using wet methods and HEPA vacuuming techniques, remove pipe intact to the extent feasible. Cutting abrading or breaking the pipe shall be prohibited. Immediately place pipe in polyethylene bag or wrap in polyethylene and label the waste.

3. At the end of each work shift, all removed pipe shall be transferred to a closed receptacle.

4. Clean up the regulated area and dispose of the asbestos-containing waste. Duct or flue edges may be wrapped in burlap or cardboard, prior to polyethylene sheeting, to protect against penetrating the disposal wrapping.

5. Dispose of transite as Category 2 non-friable waste, double wrapping intact segments in six (6)-mil polyethylene sheeting.

Y. With respect to removal of exterior vapor barrier or expansion joint, Principal Project Company shall:

1. Cordon area and set up drop cloths on the ground under the removal area and abate using wet methods. Seal vents, windows, etc. with one layer of six (6) mil polyethylene sheeting as a critical barrier. HEPA-vacuum surrounding area and drop cloths before final visual clearances.

Z. With respect to removal of PCBs and mercury containing lamps, Principal Project Company shall comply with the following:

1. Disassemble all light fixtures to visually examine the ballasts; ballasts that are not labeled as non-PCB shall be collected and disposed of as PCB-waste. Collect fluorescent tubes for disposal / recycling as mercury containing wastes.

2. Handling and Disposal of Lamps

a. Spent fluorescent and other mercury-containing lamps shall be considered a hazardous waste as per the California Department of Health Care Services.

b. Ship lamps to a commercial recycler (e.g., Mercury Technologies) where they shall be crushed and the mercury reclaimed.

c. Comply with DOT requirements for manifests, with evidence of proper disposal provided to the SAR group within the City Public Works Department, including a log of shipping dates and quantities.

d. Remove mercury fluorescent lights and load into secured cardboard boxes for shipment to prevent unnecessary breakage.

e. In the event of lamp breakage, clean-up broken glass and debris immediately, using a HEPA-filtered vacuum for final clean up.

AA. With respect to loose debris cleanup, Principal Project Company shall comply with the following:

1. Construction operations may occasionally disturb loose and peeling paints outside the immediate work area through building vibration or other means. All such loose paint and debris shall be cleaned-up daily using a HEPA-filtration vacuum. Provide adequate protection to offset future disturbances by abating or otherwise sealing affected surfaces.

2. Clean-up background or construction-related dusts from demolition of lead-coated elements or other contaminant sources using wet methods and HEPA-filtered vacuums.

3. Do not dry sweep.

BB. With respect to stabilization of loose & peeling paints, Principal Project Company shall comply with the following**:**

1. Post notices, including CDPH, Cal/OSHA and EPA RR&P notices, as applicable, prior to start of work.

2. Manually scrape and stabilize loose and peeling paints prior to demolition of painted substrates using drop cloths, wet methods, and HEPA vacuums for dust control in compliance with Cal/OSHA regulation 8 CCR 1532.11 and the EPA's RR&P rules. Avoid dry sweeping. Burning of paints, use of heat guns greater than 1,100 deg. F, and use of leaf blowers or compressed air for clean-up are prohibited.

3. Use of mechanical equipment, such as sanders, grinders and needle guns without a HEPA-vacuum attached thereto are prohibited for sites with children under the age of 6 as occupants (per EPA's RR&P rules).

4. Work areas shall be cleaned-up of lead hazards daily before leaving the site.

CC. For mechanical sanding, Principal Project Company shall comply with the following:

1. Sanding is prohibited without written authorization from the SAR group within the City Public Works Department.

2. If approved, work areas requiring mechanical sanding or stripping of painted surfaces with any lead content shall be fully contained with polyethylene dust barriers, establishing negative pressure of the zone, and using HEPA-filtered tools and other dust control procedures as outlined under 8 CCR 1532.1.

DD. For prime or painted structural steel spot abatement, Principal Project Company shall comply with the following:

1. Manually scrape paints and primers at locations of new welded connections as shown in Contract Documents. Use an approved chemical stripper with "low odor" and scrape using manual, wet methods, drop cloths, visqueen barriers, and HEPA vacuums for dust control in compliance with Cal/OSHA regulation 8 CCR 1532.1, CDPH regulation 17 CCR Section 35001 through 36100 and the EPA's RR&P rules, as applicable.

2. Avoid dry sweeping, burning of paints, use of heat guns greater than 1,100 deg. F, and use of leaf blowers or compressed air for clean-up. Use of mechanical equipment, such as sanders, grinders and needle guns without a HEPA-vacuum attached thereto are prohibited for this site per the EPA RR&P rules. Work areas shall be cleaned-up of lead hazards daily before leaving the site.

3. Note that 8 CCR 1537(c) and SFPUC require stripping of any painting coating for a distance of at least 12-inches from the area of heat application (torching/welding, etc.), or workers shall be required to use supplied air respirators in accordance with 8 CCR 1532.1 or the provisions of 8 CCR 1536(b)(c). Dispose of stripper and contaminated drop cloths as hazardous waste.

4. Ventilate the abatement zone as required by the stripper manufacturer. Workers shall wear combination organic (charcoal) and HEPA filter respirator cartridges, as necessary.

5. Note that despite the quality of abatement, some minor residues may remain on structural elements as well as paints and primers on inaccessible surfaces, which cannot be abated. During the welding phase, Principal Project Company shall operate “smog hogs” or localized exhaust units in the vicinity of welding work to prevent build-up of airborne lead contaminants within occupied and other construction areas. Localized exhaust units shall exhaust outdoors.

6. For Disposal & Cleanup: Demolish and dispose of intact painted substrates as non-hazardous waste. Characterize and dispose of loose and peeling paint debris, chemical strippers, rags, etc. as potentially hazardous waste. Clean-up drop cloths and HEPA vacuum loose and peeling chips and debris daily for all work areas before leaving the site.

EE. Principal Project Company shall comply with the following encapsulation procedures:

1. Do not start encapsulating work until receiving a notice to proceed from the SAR group within the City Public Works Department to apply encapsulant.

2. Prepare and apply encapsulant in accordance with the manufacturer's specification, using airless spraying equipment. Because application by spraying could cause dissemination of residual fibers, encapsulant must be applied with as much caution and at as low a nozzle pressure as possible.

3. Apply encapsulant in 2 coats with a tint to be approved by the SAR group within the City Public Works Department. Apply the first coat as a penetrating encapsulant, allowing it to properly dry. Then apply a second coat of bridging encapsulant.

4. Apply penetrating type encapsulant to provide complete penetration of asbestos fireproofing surfaces exposed during the controlled renovation activities in accordance with manufacturer's recommendation. Apply encapsulant using airless spray equipment.

FF. Principal Project Company shall comply with the following daily cleaning procedures:

1. Clean asbestos-containing debris and contaminated water from the work area daily using wet methods and HEPA vacuuming equipment. Place asbestos debris and water in bags, sealed and either stored or removed from the work area.

2. Worker decontamination enclosure system; clean the clean room, shower, and equipment room daily or as required more frequently to maintain acceptable clean room perimeter air sample total fiber counts. Keep the clean room floor dry and free of any waste. Repair and replace the clean room flap whenever damaged or torn.

GG. Principal Project Company shall comply with the following in bagging, drumming, and handling waste:

1. Protect all workers handling waste in full body protective clothing and at least a respirator approved by NIOSH for protection against asbestos. Workers transporting clean, sealed drums or other clean, sealed waste may handle waste with less protective clothing if approved by the SAR group within the City Public Works Department or its designee.

2. Do not allow asbestos waste to dry out prior to sealing bags.

3. Seal bags of asbestos-containing waste with tape within the work area. Seal bags with a goose neck fold: first twist bag and seal top opening with tape; fold remaining bag extension over the first tape enclosure and re-tape around top of bag there by double sealing the top opening. No free-flowing water shall be present at any time in the bag. If free-flowing water is present, Principal Project Company shall add absorbent into the bags to remedy the condition.

4. Wrap and seal waste treated as asbestos contaminated that cannot be contained in bags in 6-mil clear polyethylene plastic or other impermeable material approved by the SAR group within the City Public Works Department. Wrap objects that will tear, cut, or damage the integrity of the plastic in a protective material such as canvas or burlap to reduce the potential for damage to the plastic or other impermeable material.

5. Sealing Waste from Glove Bag with Cut-Out: Wrap sections of piping covered with ACM in a minimum of two layers of 6-mil polyethylene sheeting before removal from the work zone.

6. While in the work area, decontaminate bags and/or wrapped objects of any bulk debris by wet wiping. Utilizing the equipment decontamination enclosure system, pass the bags and/or wrapped objects into the washroom where they will be thoroughly decontaminated by wet sponging with amended water. Decontaminated bags will then be passed directly into the holding room where they will immediately be placed in a second clean bag and sealed with tape.

7. Wrap and seal decontaminated objects in a second layer of impermeable material.

8. Deposit bags with friable hazardous waste into clean sealable drums for transport. Seal filled drums. Mark drums with the label prescribed by the EPA, including the Generator I.D. Number or source location and the Waste Manifest Number.

9. Deposit bags into clean sealable dumpster for transport, except non-friable roofing which can be deposited directly into double-lined waste dumpsters for disposal at a landfill accepting Category I, non-friable ACM.

10. The SAR group within the City Public Works Department must be notified prior to removing materials from the work area and prior to loading waste into dumpsters or other transport containers for removal from the site. At least 24 hours of advance written notification must be given.

END OF SECTION

SECTION 02 81 10 - ENVIRONMENTAL MANAGEMENT OF EXCAVATED MATERIALS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Up to 80% of the surplus soils to be excavated, transported and disposed may be classified as a Hazardous Waste and/or contaminated material. The Work will involve working environments that may be hazardous, contaminated, or non-hazardous to activities associated with the excavation, handling, transportation, and disposal of all excavated materials and other wastes in the Project Site with emphasis to Hazardous Materials.

B. Serpentine, serpentinite, or other ultramafic rocks and soils containing naturally occurring asbestos (NOA) will be encountered on the Project Site.

C. Such hazardous, contaminated, and non-hazardous environments include, and are not limited to Hazardous Materials and non-Hazardous Materials, soils, groundwater, heavy metals, petroleum hydrocarbons, polynuclear aromatic hydrocarbons, organic compounds, serpentine rock and ultramafic material (which may contain natural occurring asbestos - NOA), lead-based paint materials, sewage, sludge, debris, grit, sewer gases, bacterial/biological contamination, rail road ties, oxygen deficiency, and confined spaces.

D. If Hazardous Materials are discovered, immediately notify the SAR group within City Public Works Department and the City's Authorized Representative both orally and in writing.

E. Provide employees with all levels of personal protective equipment (PPE), including personal air monitoring if required. Principal Project Company shall have taken into account the productivity losses, if any, due to the use of respirators and personal protective equipment.

F. Do not use the Project Site as a storage facility for work being performed at another site.

G. Lead Hazards: All Work that affects any level of lead will at a minimum be performed under the Cal/OSHA Lead in Construction Standard 8 CCR 1532.1 as well as all federal, State, and local regulations.

H. Hazardous Waste and non-Hazardous Waste shall only be disposed at permitted California landfills (22 CCR 66262), equivalent out-of-state landfills (40 CFR 262), permitted recycling facilities, and at other projects as approved by the SAR group within City Public Works Department.

I. Any screening or crushing operations of excavated materials cannot proceed without the appropriate BAAQMD and Cal-EPA/DTSC permits.

J. A Site Mitigation Plan was prepared and approved by the San Francisco Department of Public Health, the requirements of which are included in this Section 02 81 10.

1.2 RELATED SECTIONS

A. Section 01 35 43 Environmental Procedures

B. Section 01 35 50 Additional Environmental Procedures

1.3 SUBMITTALS

A. Principal Project Company shall submit the documents listed below no later than ten Days before start of Work at the Project Site or NTP2, whichever is earlier, before any soil disturbing activity may begin.

B. Principal Project Company shall submit the following to the SAR group within City Public Works Department as separate submittals:

1. Name environmental consultant and the accredited environmental laboratory, if used.

2. Pre-Excavation Soil Profiling Sampling Plan draft and final version in accordance with Part 1.4 herein.

3. An Environmental Site Assessment (Phase II) draft and final report in accordance with Part 1.4 herein.

4. Site Mitigation Completion Report (SMCR) as requested by San Francisco Department of Public Health.

5. Waste profile application package on each waste stream planned for disposing the excavated soil. Prepare and submit waste profile application to each proposed disposal facilities for acceptance. The formal waste profile application will also include, if any, additional information (such as slurry additive applied as part of the construction) shall be included in the formal waste profile application.

6. Waste Profile # (s) from the permitted landfills or the permitted disposal & recycling facilities that will be used.

7. Workers Mandatory Environmental Training Records in accordance with Part 1.7 herein, as requested by the City as Regulator.

8. Transporter's current Class 1 Certificate of Compliance from the California Highway Patrol and Hazardous Substance Removal Certification in accordance with Part 1.9 herein, as warranted.

9. Copy of the Non-Hazardous Waste form for and subsequent copies attached to the monthly Soil Disposal Spreadsheet in accordance with Part 1.10 herein.

10. Hazardous Waste Manifest in accordance with Part 1.11 herein, as warranted.

11. The original source of where the import soils are coming from, the name of the laboratory used to analyze the soils, and the date of chemical analysis, and the analytical test results, and frequency of the analytical testing in accordance with Part 3.3 herein.

12. Monthly Import Fill Spreadsheet in accordance with Part 3.3 herein.

13. Cal/OSHA asbestos Competent Person training records as pertaining to requirements specified in the Cal/OSHA standard 8 CCR § 1529, and when Serpentine, serpentinite, or other ultramafic rocks containing Naturally Occurring Asbestos (NOA) is present.

14. Cal/OSHA asbestos worker training records as pertaining to requirements specified in the Cal/OSHA standard 8 CCR § 1529, and when Serpentine, serpentinite, or other ultramafic rocks containing Naturally Occurring Asbestos (NOA) is present.

1.4 CLASSIFICATION AND MANAGEMENT OF EXCAVATED MATERIALS

A. The pre-excavation profiling shall be done so as to classify the excavated soils for a "load and go" disposal to a permitted California landfill or equivalent out of State landfill for Class I, II & III disposal, or permitted disposal & recycling facilities.

B. An intermediate soil staging and loading facility is not provided as part of this Agreement. Principal Project Company may use its own or a subcontracted intermediate soil staging and loading facility. Such a facility shall be permitted in accordance with applicable Laws and meet the definitions of the California Code of Regulations (CCR) Title 22, 66260.10 for "Individual generation site", "Onsite", "Onsite facility".

C. Except as otherwise stated in the Contract Documents, Principal Project Company shall perform or cause to be performed excavation, loading, handling, transportation, and disposal of all surplus waste excavated soils and sediments from dewatering activities, meeting requirements of a certified and permitted California landfill or an equivalent out-of-state landfill. All such disposal activities shall require the approval of the SAR group within City Public Works Department prior to actual loading and disposal.

D. Conditions for acceptance at various local landfills/waste disposal facilities include, filling out of a waste profile, that the surplus waste excavated soil hauled to the landfill will have greater than 50 percent solids, and cannot have any free liquids. Principal Project Company is responsible for meeting landfill requirements for disposal.

E. Principal Project Company shall maximize reuse of excavated soils. Excavated soils can be reused anywhere within the Project Site. If the soils from this area cannot be reused, such surplus waste excavated soils shall be disposed at a certified and permitted California landfill for Class I, or Class II, or Class III, disposal or an equivalent out-of-state landfill. Acceptable landfills/waste disposal facilities for California Class I, II and III wastes are:

1. Republic Services, http://www.republicservices.com/Corporate/Business/WasteRecycling/Facilities/landfills.aspx

2. Waste Management Inc, https://www.wm.com/find-a-facility.jsp

3. Clean Harbors Buttonwillow LLC, www.cleanharbors.com

F. Except for Article 1.4 herein, Principal Project Company shall not conduct any environmental or Hazardous Materials sampling or analysis without prior permission from the SAR group within City Public Works Department. If approved, the environmental or Hazardous Materials sampling shall be done in the presence of a SAR group within City Public Works Department. This does not include the Principle Project Company's obligation for any personnel air monitoring.

G. Principal Project Company shall inform the SAR group within City Public Works Department in writing and obtain City's approval prior to any sale, supply, or offer to sell excavated material. Comply with Bay Area Air Quality Management District's (BAAQMD's) Regulation 11, Rule 14 for asbestos-containing serpentine. Additional information may be found at http://www.baaqmd.gov/~/media/dotgov/files/rules/reg-11-rule-14-asbestoscontaining-serpentine/documents/rg1114.pdf?la=en, the California Air Resource Board Advisory #161 (https://ww2.arb.ca.gov/enforcement-advisory-161-serpentine-rock), and Title 17, Section 93106 of the California Code of Regulation (CCR). Principal Project Company shall perform all the engineering and chemical testing as required by the SAR group within City Public Works Department and applicable Laws and policies.

H. Cal/OSHA regulations are triggered when asbestos is present in any amount. Principal Project Company shall fulfill the obligations under CCR Title 8, Section 1529. The regulation requires monitoring to determine exposure levels, wet methods, respirators and protective clothing, controlled access to the work area, and similar precautions associated with asbestos work regardless of the origin of the asbestos. Use of a competent person to oversee the work may also be necessary. Utilize an experienced certified industrial hygienist (CIH) and a professional geologist (PG) to assist it with this work.

I. Asphalt, concrete, aggregate base, vegetation, debris, wood, obstructions, and other organic, unsound or deleterious matter shall be excavated separately from the soil layer, and shall not be reused as backfill. The removal, management, transportation, and disposal of asphalt, concrete, aggregate base, vegetation, debris, wood, obstructions, and other organic, unsound, or deleterious matter shall be incidental to its respective bid items.

J. Soils of different waste disposal classification shall be segregated when excavated, managed, transported, and disposed separately with no mixing of the different types of wastes.

K. When performing the Work, Principal Project Company shall take into account productivity losses, if any, due to but not limited to encountering and managing Hazardous Materials or non-hazardous materials, the use of respirators and personal protective equipment. The City as Regulator reserves the option and right, at any time, to use its own forces to excavate, remediate, bioremediate, haul, recycle, or dispose of both, Hazardous Materials and non-Hazardous Materials at its own facilities, State-approved facilities, contracted facilities or contracted out-of-state facilities.

1.5 DEFINITIONS

A. Waste: Discarded material of any form as defined by the Code of Federal Regulations 40 CFR 261.2 (http://www.access.gpo.gov/nara/cfr) and the California Code of Regulations 22 CCR 66261.2 (http://ccr.oal.ca.gov).

B. Hazardous Waste: This may include excavated material, friable asbestos containing material (ACM) that is not naturally occurring in rock and soil, loose and peeling lead–based paints, and other material that is regulated by and requires management, handling, transport, treatment, storage, and disposal according to the requirements of the Federal Resource conservation Recovery Act (RCRA) and associated regulation 42 U.S.C. 6901 et seq. (https://www.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act) and 40 CFR Part 260 et seq., or the California Hazardous Waste Control Law (https://www.epa.gov/rcra/resource-conservation-and-recovery-act-rcra-regulations) and associated regulations (Health and Safety Code 25000 et seq. (https://leginfo.legislature.ca.gov/faces/codes_displayexpandedbranch.xhtml?tocCode=HSC&division=20.&title=&part=&chapter=&article= and 22 CCR 66260 et seq.).

C. Management of excavated materials or “management” means transportation, transfer, recycling, recovery, disposal, handling, processing, storage, and treatment of excavated materials in accordance with applicable Laws.

D. Soil: earth material composing the superficial geologic strata (material overlying bedrock), consisting of clay, silt, sand, or gravel size particles as classified by the U.S. Soil Conservation Service. Soil does not include asphalt, concrete, aggregate base, vegetation, debris, wood, obstructions, and other organic, unsound, or deleterious matter.

E. Project Site Mitigation Plan (Project SMP): In accordance with San Francisco Health Code Article 22A and 22B, a Project SMP was approved by the San Francisco Department of Public Health on October 1, 2024, which contains mandatory requirements for managing all soil excavation activities to protect the environment and public health . .

F. Excavated material includes all soils (fill, alluvium, bedrock), and other materials generated in the course of the Work, which shall be excavated, handled, or disposed under this Agreement.

G. Waste excavated soil is excavated soil that is a waste and cannot be reused within the Project Site in accordance with reuse criteria of this Section. It is surplus and shall be managed, transported, and disposed of as part of this Agreement. Waste excavated soil does not include

asphalt, concrete, vegetation, wood, debris, obstructions, and other organic, unsound, or deleterious matter.

H. Naturally Occurring Asbestos (NOA): NOA in the City and County of San Francisco is typically associated with ultramafic, metamorphic or metamorphosed rocks within the Franciscan mélange, including serpentinite, greenstone, and blueschist. There are six regulated naturally occurring asbestos minerals: chrysotile, crocidolite (asbestiform riebeckite), amosite (grunerite-cummingtonite), tremolite, actinolite, and anthophyllite (CGS 2002). The six asbestos minerals are divided into two distinct mineral groups; serpentine minerals (chrysotile), and amphibole minerals, which include the remaining five above-mentioned minerals. These asbestos minerals are classified as known human cancer-causing substances by local, state, and federal health agencies (DTSC 2004), and regulated by name.

I. The following soil classifications with corresponding requirements are established solely for the purpose of payment for the handling, transportation and disposal of the excavated materials determined to be a waste:

1. California Class I (non-RCRA) hazardous waste: is waste excavated material that is classified as California (non-RCRA) hazardous waste, requires disposal at a California Class I disposal facility or a similarly permitted out-of-state facility and requires transport by a registered hazardous waste transporter.

2. California Class II and Class III designated waste (Class II and Class III): is non-hazardous waste, and is not a California or Federal hazardous waste. It requires disposal at a California Class II or Class III disposal facility or at a similarly permitted out-of-state facility without the need of a registered hazardous waste transporter.

3. Asbestos containing rock and soil where the asbestos is naturally occurring and not associated with cross contamination by building materials may be classified as California Class II waste. Principal Project Company shall contact the landfill it identifies to receive waste to assure that asbestos containing naturally occurring materials meet the acceptance criteria of the California Class II landfill.

1.6 WORKER'S MANDATORY ENVIRONMENTALTRAINING

A. Principal Project Company, and its DB Contractor, shall:

1. Provide sufficient numbers of properly trained personnel who may come in contact with, may be exposed to, disturb, operate equipment in, or otherwise excavate, handle, transport and dispose hazardous or contaminated excavated materials, asbestos, naturally occurring asbestos (NOA), and silica.

2. Ensure workers have the environmental training, listed below, and training certifications and personal protective equipment (PPE), as required by applicable Laws. Submit certifications or proof of such training when requested by the SAR group within City Public Works Department.

3. Hire an experienced Certified Industrial Hygienist (CIH) and a Registered Geologist (RG) to assist it with the following:

a. HAZWOPER: This training is required of Principle Project Company and DB Contractor's employees and Subcontractors who may come in contact with, may be exposed to, disturb, operate equipment in, or otherwise excavate, handle, transport and dispose hazardous or contaminated excavated materials, asbestos, naturally occurring asbestos (NOA), and silica. Employee(s) shall possess a current 40-hour Hazardous Waste Operation and Emergency Response ("HAZWOPER") training and certification and the associated 8-hour HAZWOPER

refresher training (in accordance with Sections 5192 and 5144 of Title 8, CCR and Title 29 CFR, Sections 1910.120 and 1910.134), and shall be certified to wear appropriate personal protective equipment and respirators.

b. Cal/OSHA Asbestos Class II asbestos operations and Asbestos Competent Person (ACP): Principal Project Company shall meet its obligations under CCR Title 8, Section 1529 when Serpentine, serpentinite, or other ultramafic rocks containing Naturally Occurring Asbestos (NOA) is present.

1) Principal Project Company and its DB Contractor shall have its workers, trades people and Asbestos Competent Person that will come in contact with serpentine, serpentinite, or other ultramafic rocks containing Naturally Occurring Asbestos (NOA) be trained for the Class II work activity level as per the Cal/OSHA standard 8 CCR § 1529.

2) Principal Project Company shall have a Cal/OSHA Asbestos Competent Person as it pertains to requirements specified in the Cal/OSHA standard 8 CCR § 1529, and when serpentine, serpentinite, or other ultramafic rocks containing Naturally Occurring Asbestos (NOA) is present.

c. SILICA: Principal Project Company shall meet its obligations under the Respirable Crystalline Silica standard for construction, found in the California Code of Regulations, Title 8, Sections 1530.1, 1532.3, and 5155; and OSHA Regulation 29 CFR 1926.1153.

d. Health and Safety training.

e. Lead awareness training (for all trades who will come in contact and disturb lead containing paints as per Cal/OSHA 1532.1 Lead in Construction standard). If personal exposures to the workers exceed the 8-hr Permissible Exposure Level (PEL) of 50 micrograms/cubic meter, such worker(s) must have received training as a CDPH Certified Lead Worker (as per 17 CCR Division 1, Chapter 8).

f. Dust Control and Mitigation awareness training to enable Principal Project Company’s personnel to comply with Sections 01 35 49 Minimum Environmental Procedures and 01 35 50 Additional Environmental Procedures.

g. Medical examination and blood tests (as warranted).

h. Respiratory protection (including current respirator fit test records).

i. Other training as necessary and pertaining to the work being conducted.

B. Only qualified persons shall engage in Hazardous Materials-related work. Principal Project Company and DB Contractor personnel, who come in contact with, are exposed to, disturb, operate equipment in, or otherwise handle hazardous or contaminated materials, or demolition debris shall have appropriate hazards communication, environmental training and medical monitoring.

C. The City will not grant extensions of time or increases in payment for costs associated with Principal Project Company's productivity losses, inability to provide properly trained personnel, costs of training Principal Project Company's workers, or hiring of required personnel.

D. It is Principal Project Company’s responsibility and liability to ensure that its workers and contractor have the proper training, personal protective equipment (PPE), and respiratory protection.

E. Principal Project Company and its DB Contractor, not the City, is responsible for the health and safety, training, personal protective equipment (PPE), and monitoring and protection from exposure risks of its employees, as per federal, state and local statutes, laws and regulations.

F. Principal Project Company is obligated to conduct any required personal air monitoring of its workers, at its own expense, in accordance with Section 01 35 45 Health and Safety Criteria.

1.7 REGULATORY INDEMNIFICATION

A. Principal Project Company is specifically alerted to, and shall familiarize itself and its DB Contractor to, the liability statutes of:

1. The Comprehensive Environmental Responses, Compensation, and Liability Act (CERCLA) of 1980 found in 42 USC, Section 9601 et seq.

2. The Superfund Amendments and Re-authorization Act (SARA) of 1986 found in 42 USC, Section 9601 et seq.

3. The California Hazardous Substance Account Act (HSAA) of 1981 found in California Health and Safety Code, Section 25300 et seq.

4. California Health and Safety Code, Division 20, Regulations and CCR 22 Section 6600 et. seq.

5. Cal/OSHA Lead in Construction Standard, Title 8, CCR, Section 1532.1.

6. BAAQMD Regulation 6 for Particulate Matter and Visible Emissions (http://www.baaqmd.gov/~/media/files/planning-and-research/rules-and-regs/workshops/2017/rg0601-pdf.pdf?la=en) and Regulation 11 for Hazardous Pollutants (http://www.baaqmd.gov/regs/rulereg.htm).

7. The Final Regulation Order of the California Code of Regulations (CCR) Title 17, Public Health, Section 93105, on Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (http://www.baaqmd.gov/~/media/Files/Compliance%20and%20Enforcement/Asbestos/final_reg_order.ashx).

8. The California Air Resources Board (CARB) Asbestos Airborne Toxic Control Measure for Surfacing Applications.

9. The San Francisco Building Code Section 106.3.2.6

10. San Francisco Health Code, Article 22B - Construction Dust Control Requirements.

11. The DPW Dust Control Order 171,378.

B. Principal Project Company shall be responsible for all liability and costs necessary to prevent its own or DB Contractor's operations from violating federal, State, or local statues, laws, regulations, and policies.

1.8 REQUIREMENTS FOR THE TRANSPORTER

A. As warranted, Principal Project Company shall ensure that its drivers have in their possession, during the hauling of material and soil, all applicable State and local vehicle insurance requirements, valid driver's license, and vehicle registration and licensing. A current Class 1 Certificate of Compliance from the California Highway Patrol shall be affixed to each vehicle.

B. All hazardous materials/waste haulers shall possess a Hazardous Substance Removal Certification granted by the State of California, Contractors State License Board (1-800-321-2752 or http://www.cslb.ca.gov), and all other required certifications and insurance.

C. Haul trucks carrying excavated material shall be loaded so that the material does not extend above the walls of the truck bed, and there is no leakage from any vehicle. All truckloads shall be covered.

D. All truckloads containing Naturally Occurring Asbestos (NOA) and Serpentinite require both covering the load as well as lining the underneath of the truck bed ("burrito wrap") with 10mil HDPE. This is required regardless if the material is wet, hazardous, or non-hazardous.

E. Principal Project Company shall be responsible for cleaning up excavated material spill, which occurs during loading, handling, and transportation.

F. Preparation for shipment: Marking, labeling, placards, and packaging prior to transport shall be in accordance with all regulations and shall be the responsibility of Principal Project Company.

1.9 USE OF NON-HAZARDOUS WASTE MANIFEST FOR CLASS II MATERIAL OR LESSER

A. For transportation and disposal of the non-Hazardous Waste, Principal Project Company shall initiate and fill out a non-Hazardous Waste profile form with the Class II/III landfill of its choosing. Then, submit this waste profile form to the SAR group within City Public Works Department for its approval & signature. Next, Principal Project Company shall prepare a non-hazardous waste manifest form from the landfill. The non-hazardous waste manifest form shall be completed for each vehicle carrying excavated material classified as California Class II and Class III designated waste, or of a lesser waste classification. Principal Project Company shall submit the non-hazardous waste manifest form to the SAR group within City Public Works Department for the Generator's signature at least 72 hours in advance of the day of the off-haul with an estimate of the number of loads scheduled for off-haul. The non-hazardous waste manifest form shall contain the following information before providing the final copy to the SAR group within City Public Works Department to sign:

1. Name, address and phone number of the Generator, Project name, and Specification Section number.

2. Principal Project Company's billing information

3. The soil profile approval number and description of the waste.

4. Name, address and phone number of the transport company.

5. The name, address, and telephone number of the receiving facility i.e., disposal facility.

B. The City will not be responsible for off haul delays if Principal Project Company does not notify the SAR group within City Public Works Department in a timely manner to sign the non-hazardous waste manifest forms.

C. On a monthly basis, Principal Project Company shall provide the SAR group within City Public Works Department with a copy of each completed non-hazardous waste manifest Form (with the landfills signature) and its corresponding certified weight ticket.

1.10 HAZARDOUS WASTE MANIFESTING PROCEDURES FOR CLASS I MATERIAL

A. As warranted, Principal Project Company shall furnish all labor, materials, equipment, and incidentals required to transport those materials identified as Hazardous Waste for the purpose of disposal.

B. Principal Project Company shall comply with all applicable regulatory requirements listed as well as other applicable federal, State, or local laws, codes, and ordinances, which govern or regulate transportation of wastes (including but not limited to DOT-HM 181 in accordance with 49 CFR 172).

C. All material classified as hazardous waste (Federal Class1 RCRA and California Class1 non-RCRA wastes only) shall be hauled off using a licensed hazardous waste transporter and the uniform hazardous waste manifest form (DTSC Form 8022A and/or EPA Form 8700-22 a.k.a. the manifest).

D. Preparation and handling of waste manifests:

1. For transportation and disposal of the Hazardous Waste, Principal Project Company shall initiate and fill out a Hazardous Waste profile form with the Class I landfill of its choosing. Then, it shall submit this Hazardous Waste profile form to the SAR group within City Public Works Department for its approval and signature. Next, Principal Project Company shall provide and prepare the Hazardous Waste manifest for each shipment of Hazardous Wastes from the Project Site. Principal Project Company is hereby notified that Hazardous Waste manifest, waste profiling, and landfill service agreements have to be prepared and have to be approved by the landfill in advance of the off haul. Principal Project Company shall consult with the SAR group within City Public Works Department for local requirements in filling out the forms.

    a. The manifest shall describe the contents of each truck carrying materials to the waste disposal site, including the weight of the waste materials. Weight, not volume, shall be used to measure waste quantities.

    b. The SAR group within City Public Works Department will provide a Hazardous Waste generator identification number for use on the manifest. Principal Project Company shall provide the State Transporter identification number and telephone number.

    c. The licensed transporter shall also sign and date the manifest indicating that it has accepted the load described in the manifest on that particular day.

    d. Only a City employee (and not Principal Project Company) from the SAR group within City Public Works Department will sign the manifest for the “generator” of the waste.

E. Principal Project Company shall notify the SAR group within City Public Works Department 72 hours prior to off-haul of all excavated material. If the manifest

and other forms above are to be signed by the SAR group within City Public Works Department during periods other than the hours stipulated above, Principal Project Company shall give an additional 72-hour advance notice to the SAR group within City Public Works Department.

F. The SAR group within City Public Works Department will sign and keep the Generator's copy and give the remaining copies to the licensed transporter.

G. The licensed transporter shall carry the hazardous waste manifest with each truckload using the traffic control approved routes for off haul

H. Within 2 days of its return, Principal Project Company shall provide the SAR group within City Public Works Department with the completed waste manifest. The completed waste manifest shall be certified by the receiver of the waste shipment, confirming that the shipment was received at the waste treatment or disposal facility designated in Principal Project Company's bid, and certifying the weight of the shipment.

I. Should any waste manifest not be returned within 35 days of shipment, Principal Project Company shall initiate follow-up, shall document such follow-up effort in writing with an Exception Report in accordance with 40 CFR 262.42 and/or 22 CFR 66262.42, and shall provide a copy to the SAR group within City Public Works Department.

J. Mandatory Information for the Manifest

1. Manifest Item 1: Generator's US EPA ID Number for Project. (Will be provided by the City after NTP as deemed necessary)

2. Manifest Item 3: Emergency response Phone: # 24 hours line to be provided by Principal Project Company

3. Manifest Item 5:

   Generator's Name and Mailing Address:
   SFDPH
   Municipal Hazardous Waste Program
   49 South Van Ness Avenue, Suite 600
   San Francisco, Ca 94103

4. Generator's Site Address:
   Name of the project

5. Manifest Item 14: The following information is mandatory:

   a. Contract JO # & Name of Project TBD

   b. Project Manager: TBD

   c. Project Manager Phone Number #:

   d. Profile # _____(Defined when manifest is generated. To be obtained and provided by Principal Project Company)

6. The City & County of San Francisco applies for an exemption from the BOE Hazardous Waste Generator fees in accordance with H&SC 25174.7, 25174.1; 25205.5, and 25345. (1) Hazardous wastes which result when a government agency, or its contractor, removes or remedies a release of Hazardous Waste in the state caused by another person, and in an area from beneath a public street and originated from earthquake fill."

1.11 UNDERGROUND TANK REMOVAL PROCEDURES

A. Principal Project Company is alerted to the fact that underground structures and tanks may be encountered during excavation. In the event that an underground storage tank, pipes, and associated fixtures are encountered, Principal Project Company shall immediately suspend the work in the immediate area and notify the SAR group within City Public Works Department as well as the San Francisco Department of Public Health.

B. Principal Project Company shall be responsible for removing and disposing the underground storage tank, pipes, and associated piping in the excavation area according to applicable laws and regulations including:

1. California Health and Safety Code (H&SC), Division 20, Chapter 6.9 (Section 25280 et.seq.)

2. California Code of Regulations (CCR), Title 23, Division 3, Chapter 16 (Section 2610 et.seq.)

3. California State Water Resources Control Board (SWRCB), Leaking Underground Fuel Tank (LUFT) Manual.

4. City & County of San Francisco, Department of Public Health, Underground Storage Tank Removal Regulations. Information available at but not limited to https://www.sfdph.org/dph/EH/HMUPA/UST.asp

C. Principal Project Company shall obtain all permits, excavate, sample, analyze and prepare all reports as required by the San Francisco Health Code.

D. Principal Project Company shall prepare an Underground Storage Tank (UST) Closure Plan in compliance with Article 21 of the San Francisco Health Code, if UST's will be removed. Principal Project Company shall only remove the underground tanks, pipes, and related appurtenances only in the presence of an inspector from the City's Department of Public Health, the City's Fire Department, and the City's Authorized Representative.

E. Principal Project Company shall furnish documentation of the removal of an underground tank.

1.12 DISPOSAL OF RAILROAD TIES AND TREATED WOOD WASTE

A. Railroad ties and wood treated with preservatives (e.g. utility poles, piers, pilings, posts, pressure treated lumber, etc), such as creosote, and/or pentachlorophenol, and/or Copper Napthenate, Zinc Napthenate, and/or Copper, Chromium, Arsenate (CCA), and/or Ammonical Chromium, Zinc, and Arsenate (ACZA) (that are not otherwise recycled by Principal Project Company) shall be transported and disposed of at a California Class 2 (non-hazardous) landfill.

B. For wood treated with chemical preservatives such as Chromate Copper Arsenate (CCA) treated wood: Principal Project Company shall comply with the Federal Insecticide, Fungicide, Rodenticide Act (FIFRA) and by the California Department of Pesticide Regulation (DPR) and Department of Toxic Substances Controls (DTSC) Regulations or for the treated wood waste as per the Health and Safety Code (HSC) 25150.7 and 25150.

C. Principal Project Company shall fill out a separate waste profile with the landfill for such materials.

D. The transportation and disposal of the railroad ties and treated wood waste shall be paid as a change order.

1.13 POLLUTION INSURANCE

A. All Work that involves the management, handling, transportation, and disposal of hazardous and contaminated (non-hazardous) materials shall be performed either by Principal Project Company or a properly licensed Principal Project Company, who shall furnish evidence of Principal Project Company's Environmental Pollution Liability Insurance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SITE MITIGATION PLAN REQUIREMENTS

A. Principal Project Company shall ensure that all activities associated with soil excavation comply with the requirements of the approved Project SMP (see definitions above), which include but are not limited to:

1. Environmental controls, which include:

a. Health and safety requirements;

b. Site control and exclusion zones requirements

c. Project signage requirements

d. Noise control requirements

e. Equipment decontamination requirements

2. Soil management, which includes:

a. Soil field screening requirements

b. Soil containment requirements

c. Dust and fugitive emissions control requirements

3. Excavation activities, which include:

a. Bedrock asbestos requirements

b. Excavation dewatering requirement

4. Stormwater protection requirements

5. Backfilling and restoration requirements

6. Waste management and disposal, which includes:

a. Areas of potential concern requirements

b. Soil waste management requirements

7. Asphalt and concrete debris waste management requirements

8. Groundwater waste management requirements

9. Recordkeeping requirements

B. Upon completed implementation of the Project SMP, Principal Project Company shall submit the following documents to the SAR group within City Public Works Department as well as the City Public Health Department:

1. Verification sampling results from the areas of soil vapor samples SVP-4I and

SVP-7S, that demonstrate either tetrachloroethene (PCE) is not present in sub-slab vapor at concentrations that pose a vapor intrusion concern following completion of the new slab, or PCE is not present in indoor air at concentrations that pose an unacceptable health risk following completion of the new slab and building envelope.

2. A Site Mitigation Completion Report (SMCR) which documents implementation of the SMP, including the dust and fugitive emissions control plan contained therein, including any additional sampling, soil disposal, and post-construction verification sampling activities.

C. In the event Project SMP requirements differ from the remainder of these Part 3 Sections 3.2 – 3.6, the Project SMP requirements shall supersede.

3.2 TEMPORARY STOCKPILING OF EXCAVATED MATERIAL AND IMPORT MATERIAL

A. Principal Project Company shall comply with Article 2.4: Excavation in the Public-Right of-Way and specifically Article 2.4.53(c) Storage of Materials and Equipment.

B. If feasible and in the event that the SAR group within City Public Works Department permits Principal Project Company to temporarily stockpile excavated and import material along the project alignment, the following conditions shall apply (including those in Sections 01 35 43 Environmental Procedures and 01 35 50 Additional Environmental Procedures):

1. Material shall be stockpiled at a location approved by the City. The volume of the stockpile will be limited within the discretion of the City.

2. Stockpiled materials shall not be stored for more than 48 hours.

3. The City retains the right to suspend the use of temporary stockpiling in the event of negative public perception, aesthetic concerns, and regulatory concerns. In such an event, Principal Project Company is directed to remove the stockpile within 24 hours.

4. After a stockpile has been removed, Principal Project Company shall wet sweep and vacuum the area, street, and sidewalk to remove residual soil, restore the site to its original condition.

5. Stockpiles of site backfill soils shall be tarped using a different colored tarp from that of import soils.

6. Stockpiles must be kept adequately wetted, treated with a chemical dust suppressant, or covered when material is not being added to or removed from the pile, and securely tarped & braced (weighted or tied down).

7. Stockpile Maintenance requirements in Section 01 35 43 Environmental Procedures and Section 01 35 50 Additional Environmental Procedures.

C. All costs associated with the temporary stockpiling of soils shall be borne by Principal Project Company. Such related incidental costs include, but are not limited to dust control, vacuum and wet sweeping, covering of stockpiles, multiple handling and transportation, multiple staging, work re-sequencing or rescheduling, time loss and standby time due to the duration of storage, and complying with Federal, State, and local requirements.

3.3 REUSE OF EXCAVATED SOILS AS BACKFILL

A. For backfill work: Principal Project Company shall maximize the reuse of native soils from the excavation, unless directed otherwise by the SAR group within City Public Works Department. In such a case, the following conditions shall apply:

B. The reuse of native soils as backfill material shall meet the requirements of Part 7 – Excavation, Backfill and Embankment of the Standard Specifications and Plans, Department of Public Works, City and County of San Francisco. The Standard Specifications and Standard Plans are accessible online at http://www.sfpublicworks.org/services/standards-specifications-and-plans

1. Native soils to be reused must not contain asphalt, concrete, bentonite, bay mud, clay, bricks, cobblestones, rocks, rubble, scrap metal, railroad tracks and ties, debris, contaminated soils, vegetation, wood obstructions, and other organic, unsound, objectionable, or deleterious matter. Principal Project Company shall remove such materials matter prior to the placement and reuse of fill.

2. Native soils must meet sieve and chloride requirements. Principal Project Company shall submit sample results to the SAR group within City Public Works Department prior to placement.

3. With approval by the SAR group within Public Works Department, native soils that are visually contaminated or are classified as a California Class I (non-RCRA) may be reused within the "area of contamination" and within 150 linear feet from its origin. Re-use of native soils must meet the engineering backfill and compaction requirements, is delineated with markers, documented, and meets the San Francisco Department of Public Health (SFDPH) requirements.

4. Principal Project Company shall notify the SAR group within City Public Works Department when and where the soils are used as backfill.

5. Surplus native soils shall be properly characterized and disposed of.

3.4 REUSE AND RECYCLING OF EXCAVATED SOILS AT OTHER FACILITIES

A. If Principal Project Company seeks to reuse or recycle surplus excavated soils at other projects or recycling facilities rather than dispose of them at a permitted landfill, Principal Project Company shall ensure the Contractor responsible for such reuse or recycle work, at its cost:

1. Demonstrate that with the existing environmental test results that the soils can be reused or recycled. Principal Project Company at its expense may be allowed to conduct additional testing, and characterization of the soils, only with prior approval by the SAR group within City Public Works Department.

2. Submit the acceptance criteria of the receiving facility or project.

3. Submit a letter of acceptance from the receiving facility or project. The letter shall indicate the volumes of soils accepted. Submit a value engineering calculation demonstrating cost savings to the SAR group within City Public Works Department. Any savings that result from such reuse or recycle work will be a spilt 50/50 between the City and Principal Project Company.

B. If the SAR group within City Public Works Department accepts the above, Principal Project Company shall in connection with such reuse or recycling:

1. be responsible for, and indemnify the City from, any and all increased cost and future liability arising from the reclassification, recycling, or reuse or the surplus excavated soils if, upon reuse or recycling of such soils at any time thereafter, it is determined that the surplus excavated soils are in fact hazardous, and should not have been reused or recycled.

2. Submit a copy of the letter of acceptance and all records, including the financial statements for the value engineering saving prior to the approval of the reuse or recycling of these soils.

3. Bear all costs for any additional testing, characterization and profiling of the soils, including the value engineering cost.

4. Bear all costs for the transportation, and any other associated cost for moving these soils to another project or to a recycling facility.

5. Revise and retain its pollution liability insurance to cover this work.

6. Repay any cost that the SAR group within City Public Works Department at its discretion will incur to conduct its own testing to confirm Principal Project Company's findings.

7. Submit a monthly reuse and recycling spreadsheet of all reused and recycled materials generated from the Project. The spreadsheet shall include information of the receiving facility or project, quantity transported (Cubic Yards), weight tags from the recycling facility.

8. The City will issue a Change Order for this work to effectuate any saving that may accrue from this Section.

9. Such work shall only be done as a Change Order after the acceptance and approval of the City and after the Change Order is processed.

3.5 IMPORT SOIL (FILL)

A. Import soil (Fill) is soil or fill material received from sources outside of the Project right-of-way. Import soil (fill) includes import bedding sand and import recycled backfill sand used in the base and subbase layers of a pavement or roadway or sporting field.

B. Environmental/chemical testing is required for each source and of the same soil classification type (based on the unified soil classification system) of the import soil (fill).

C. In advance of hauling in and use of import soil (fill) Principal Project Company for each source of import soil (fill), shall provide the SAR group within City Public Works Department the original source of where the import soil (fill) is coming from, the name of the laboratory used to analyze the soils, and the date of chemical analysis. Laboratory results shall not be over 6 months old.

D. Principal Project Company shall provide chemical analytical results for each source and of the same soil classification type (based on the unified soil classification system) of import soil (fill) in accordance with the Recommended Fill Material Sampling Schedule stated in the Department of Toxic Substances Control (DTSC) Advisory Note for Clean Imported Material (as shown below). If Principal Project Company brings import soils from different sources, then the "Sample per Volume" count re-starts for each of different source of import soil (fill) (as shown below).

Import Fill Volumes (for each source of import soil (fill) and of the same soil classification type)	Samples Per Volume for each source of import soil (fill) and of the same soil classification type
Up to 1,000 cubic yards	1 sample per 250 cubic yards
1,000 to 5,000 cubic yards	4 samples for the first 1,000 yards + 1 sample per each additional 500 cubic yards
Greater than 5,000 cubic yards	12 samples for the first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

E. Each source of import soil (fill), import bedding sand and import recycled backfill sand of the same type, shall be analyzed as a four-point composite. Each composite shall be analyzed for Total Petroleum Hydrocarbons-Gasoline/BTEX/MTBE (EPA Method 8015 mod/8021), TPH-Diesel/Motor Oil (EPA Method 8015 with silica gel cleanup), Volatile Organic Carbons VOC's (EPA Method 8260), Semi-Volatile Organic Carbons SVOC's (EPA Method 8270), Organochlorine Pesticides (EPA Method 8081), Polychlorinated Biphenyls (EPA Method 8082), Title 22 Metals (EPA Methods 6000/7000 Series), Asbestos (CARB Method 435), Chromium +6 (EPA Method 7199), and soluble Total Concentration Leaching Potential (TCLP) and Soluble Threshold Limit Concentration (STLC) metals (as warranted – 10x STLC & 20x TCLP).

F. Import soils (fill) has to meet both the engineering backfill criteria and the chemical criteria of these contract specifications.

G. Chemical Criteria: To be accepted, the chemical concentrations of the import soil (fill) has to be equal or less than the values set forth in the Regional Water Quality Control Board (RWQCB)'s Environmental Screening Levels (ESLs), Tier 1 levels. Soils (fill) with the following chemical levels shall not be accepted as import soils (fill).

1. Exceedance of the chemical values set forth in the Regional Water Quality Control Board (RWQCB)'s Environmental Screening Levels (ESLs), Tier 1 levels.

2. Lead that exceeds 80 mg/kg.

3. Serpentine (naturally occurring asbestos) and odorous soils

4. Petroleum Hydrocarbons or Oil and Grease of any type that exceed 100 mg/kg.

5. Asphalt, concrete, bentonite, bay mud, clay, bricks, cobblestones, rocks, rubble, scrap metal, railroad tracks and ties, debris, soils containing asbestos, imported contaminated soils, vegetation, wood, debris, slag, obstructions, and other organic, unsound, unsatisfactory, or deleterious matter.

H. Environmental/chemical testing is not required of the base and subbase layers for the following materials that are used to build a pavement or roadway or sporting field: Base rock, Class II Aggregate Base (AB), Class II Recycled Base, Crushed Aggregate Base (CAB), Crushed Miscellaneous base (CMB), Processed Miscellaneous Base (PMB), Recycled Aggregate, Aggregate Subbase (ASB), reclaimed/recycled asphalt concrete (AC), and drain/crushed rock.

I. Reclaimed/recycled asphalt concrete (AC) is acceptable for the base and subbase layers to build a pavement or roadway or sporting field.

J. Crushed concrete is acceptable for the base and subbase layers to build a pavement or roadway or sporting field.

K. Import material for backfill shall comply with the Section 714 Standard Specifications and Plans, Department of Public Works, City and County of San Francisco. The Standard Specifications and Standard Plans are accessible online at http://www.sfpublicworks.org/services/standards-specifications-and-plans; and the specifications of the Water Department for work under the jurisdiction of the SFPUC's Water Department.

L. The SAR group within City Public Works Department reserves the right to spot check and analyze the import soils (fill) as it deems necessary, including prior to it being brought on to the project site, even after the approval of the submittal of analytical results from Principal Project Company, as well as after it is brought onsite.

M. Should the analyses of the import soils (fill) test out to exceed the above criteria, then Principal Project Company shall be given a chance to re-sample, for re-analyses. Should the re-analyses import soils (fill) test out to exceed the above criteria, then Principal Project Company shall have to remove the import soils (fill) at its own expense and replace with clean import soil (fill). In such a case, Principal Project Company shall bear all the cost (including the City's cost) for re-analysis.

N. For recreation and park projects, and community/urban gardens, Principal Project Company shall install a visual barrier (such as a plastic orange snow fence) in all areas between the native fill, backfill from other areas of the site, and the import (soil) fill. Principal Project

Company shall request the SAR group within City Public Works Department inspection of the visual barrier, and obtain their approval prior to Principal Project Company filling soil over it.

O. Principal Project Company shall request inspection of the subbase placement for proper grands and depths by the SAR group within City Public Works Department, and obtain their approval prior to Principal Project Company filling soil over it.

P. Analytical costs for imported fill (soil) shall be born by Principal Project Company.

Q. Principal Project Company shall furnish the above analytical results at least 10 working days prior to bringing the import soil (fill) into the Project Site. The acceptance of import soil (fill) will be made by the SAR group within City Public Works Department and will depend on the results of the analytical testing, backfill requirements of the Contract Documents regardless if it meets the testing requirements of Division 31 Earthwork and Section 31 23 33 Trenching and Backfilling.

R. Import soil (fill) shall not be brought on-site, prior to approval of the analytical results by the SAR group within City Public Works Department. Analytical results submitted shall be referenced on the import fill spreadsheet submittal.

S. Import soil (fill) shall be brought on-site at a rate where it is immediately used in the excavation. If the SAR group within City Public Works Department allows for import material to be stored overnight (only, and not longer) on site, then such import material shall be covered and placed at Principal Project Company's soils management yard, approved soil stockpile staging area or an area within the project alignment authorized by the SAR group within City Public Works Department. Stockpiles being stored overnight shall be completely covered with 10 mil HDPE plastic and braced (weighted or tied down) securely.

T. Import Fill Spreadsheet: As warranted, Principal Project Company shall submit five hardcopies or a digital copy of a monthly spreadsheet of all imported fill deposited at the Project Site to the SAR group within City Public Works Department. The spreadsheet shall include information on the project name, contract No., origin of import (street address, city), location of deposit (street address and depth range), quantity (cubic yards), soil type based on the unified soil classification system, the corresponding chemical, correspondent environmental analytical results submitted, truckers and trucking firm(s) used and trucking logs and invoices.

3.6 SECURING AREAS WITH EXPOSED, EXISTING SOIL

A. Wherever Construction Work exposes the existing soil or where existing soil is stockpiled, these areas shall be barricaded all around with continuous (no gaps greater than 4 inches) fencing (either metal wire or orange plastic), Triton barriers or other barricades at least 3 feet high. Principal Project Company shall ensure that barricades are installed taunt and secured against strong winds. Alternatively, the exposed, existing soil in excavation areas such as trenches, may be covered over with plates or other acceptable means. The intent is to secure the exposed, existing soil from public contact.

END OF SECTION

Division 11: Make-Ready Requirements for Retail Space at 17th Hampshire

Division 11: Make-Ready Requirements for Retail Space at 17th Hampshire

Principal Project Company shall plan for, design, and construct a retail space as part of the Infrastructure Facility at the corner of 17th Street at Hampshire Street. The retail space shall be approximately 600 square feet and be delivered in a 'warm shell' condition at Substantial Completion, enabling the permitted occupancy of a to-be-determined retail use.

The retail space must be operationally ready, which means it must meet the following requirements:

1. Receive a temporary certificate of occupancy from the City as Regulator;
2. Walls and ceilings are finished, furred as necessary and with the installation of drywall complete;
3. Flooring materials must be waterproof;
4. Life safety systems including fire alarm, fire suppression systems, and emergency signage must be installed, tested and operational;
5. Lighting and lighting controls must be installed and tested to meet minimum retail occupancy requirements required by code;
6. Electrical service and systems and water service are installed, operational, and metered separately from the Infrastructure Facility;
7. Potable water service and systems are installed, operational, and metered separately from the Infrastructure Facility;
8. Telecommunications systems are installed and tested and include at least three data drop locations with full internet and voice capabilities;
9. Security systems are installed and tested, including a card access control system and a surveillance system;
10. Mechanical systems for heating, cooling, and ventilation are installed and tested and meet minimum code requirements for a retail space of this size; and
11. Plumbing systems, including domestic cold/hot water, hot water heater, sanitary waste and venting, condensate drainage for lunchroom sink, and one adjacent multi-gender, single occupant restroom facility are installed, tested, and operational.