

**TECHNICAL SPECIFICATIONS  
(TECHNICAL PROVISIONS)**

**SECTION TP01**

**SCOPE AND RESPONSIBILITIES**

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## Section TP01: Table of Contents

### SECTION TP01 SCOPE AND RESPONSIBILITIES

#### TABLE OF CONTENTS

Section	Page
<b>TP01: SCOPE AND RESPONSIBILITIES</b> .....	<b>01-1</b>
TP01.01 SCOPE AND PURPOSE.....	01-1
A. General.....	01-1
1. Automatic Dodrs and Steps Rehabilitation.....	01-2
2. Air Supply Unit Rehabilitation.....	01-2
3. Automatic Coupler Rehabilitation.....	01-2
4. Articulation Wiring Harness Redesign and Replacement.....	01-2
5. Trailer Truck Electric System Cable Assembly (PSC-2) Replacement.....	01-2
B. Intent.....	01-4
TP01.02 DEFINITIONS.....	01-4
TP01.03 ABBREVIATIONS.....	01-12
TP01.04 RESPONSIBILITIES OF THE CONTRACTOR.....	01-17
A. General.....	01-17
B. Drawings and Other Relevant Documents.....	01-18
1. SFMTA-Supplied Drawings and Manuals.....	01-18
2. Contractor's Drawings and Manuals.....	01-18
C. Design Approval.....	01-18
1. General.....	01-18
D. Reports.....	01-18
E. First Article Inspection (FAI).....	01-18
F. Quality Assurance.....	01-19
G. Testing.....	01-20
H. Subcontracts.....	01-20
I. Master Program Schedule.....	01-20
TP01.05 DRAWINGS.....	01-20
A. Approval Drawings.....	01-20
B. Submittal Form.....	01-21
C. Contract Drawings.....	01-23
TP01.06 CAR HISTORY BOOKS.....	01-24
TP01.07 INTEGRATED MANAGEMENT PLAN.....	01-24
A. General.....	01-24
B. Pre-Bid LRV Inspections.....	01-25
C. Correspondence and Communications.....	01-25
D. Contractor's Management Plan.....	01-25
E. SCHEDULE.....	01-26
F. MEETINGS.....	01-27
1. Design Review Meetings.....	01-27
2. Progress Update Meetings.....	01-27
3. Other Meetings.....	01-27
G. SYSTEMS ENGINEERING AND INTEGRATION.....	01-27
H. Configuration Control.....	01-28
I. Weight Control Program.....	01-28
J. Inspections.....	01-28
K. Testing.....	01-29
L. Industry Standards, Codes, and Regulations.....	01-29
M. Quality Assurance/Quality Control (QA/QC).....	01-29
N. Labels.....	01-29

## Section TP01: Table of Contents

---

TP01.08	DELIVERY AND ACCEPTANCE CRITERIA .....	01-29
A.	Test Plans .....	01-29
B.	Release for Shipment.....	01-30
C.	Acceptance .....	01-30
TP01.09	CONTRACT DELIVERABLE REQUIREMENTS LIST .....	01-30

## SCOPE AND RESPONSIBILITIES

### TP01: SCOPE AND RESPONSIBILITIES

#### TP01.01 SCOPE AND PURPOSE

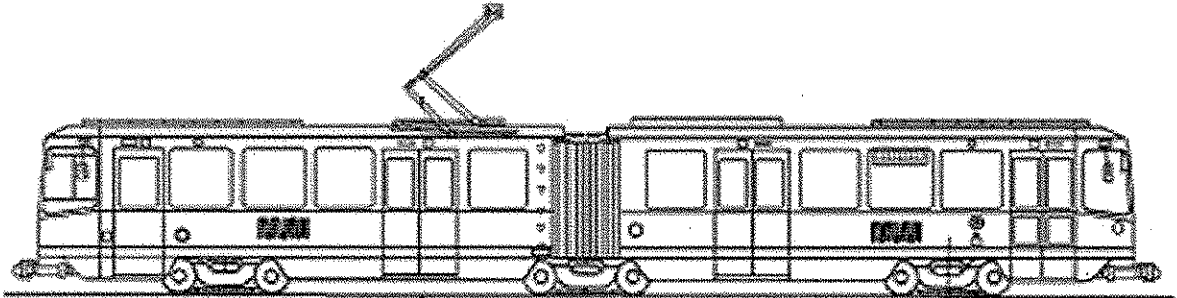
##### A. General

These Technical Provisions provide a general description for the rehabilitation of five specific systems on the San Francisco Municipal Transportation Agency (SFMTA) light rail vehicles (LRV's). The fleet includes the following:

Vehicle	Quantity	Year of Acceptance	Builder
LRV2	77 (75)*	1996-1999	Ansaldo Breda
LRV3	74 (72)*	2000-2003	Ansaldo Breda

\*The work in question will be performed on all of the aforementioned vehicles with the following exceptions. Two LRV2 and two LRZV3 vehicles are currently out of service due to minor collision damage. They will be provided to the Contractor for rebuild following completion of the collision damage repair. An additional two LRV2 and two LRV3 vehicles are out of service with major collision damage, and are not included in the scope of this rebuild task.

The most noticeable difference between LRV2's (shown below) and LRV3's is that the door operators are distinctly different, as discussed in the Door and Step System Section TP04 of these Technical Provisions.



The five specific rehabilitation/replacement tasks are as follow:

- Automatic Doors and Steps Rehabilitation
- Air Supply System Rehabilitation
- Automatic Coupler Rehabilitation
- Roof Articulation Wiring Harness Redesign and Replacement
- Trailer Truck Electric System Cable Assembly (PSC-2) Replacement

The following subsections provide an overview of each task. Specific work to be performed for each task is provided by section in these Technical Provisions.

## **SCOPE AND RESPONSIBILITIES**

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### **1. Automatic Doors and Steps Rehabilitation**

This task is the major element of the project. The SFMTA LRV's are rather unique in that they utilize a movable step box that adjusts the boarding height from level boarding at a platform, to a two-step boarding at street level. Additionally, during level boarding, an automatic bridge plate extends outward from the car to further close the gap with the platform. Thus, the step system is as complicated as the automatic door system. The doors on these vehicles are of two designs. One set of cars uses a single operator for both leaves of a door opening, while the other uses one operator per leaf. It is required to rebuild the door and step systems in-kind. In general, all mechanical components of the door and step operators shall be rebuilt or replaced, and all supporting electrical hardware shall likewise be tested, rebuilt, and or replaced.

### **2. Air Supply Unit Rehabilitation**

Air supply units consist primarily of a compressor, motor, and dryer. Rebuild procedures are provided by the OEM, but it is the responsibility of the Contractor to verify these procedures and propose changes as appropriate. These units must be rebuilt and placed back into service.

### **3. Automatic Coupler Rehabilitation**

This task requires the rebuild or replacement of the entire coupling system, both electrical and mechanical. The bulk of the work is mechanical, such as replacement of bushings, bellows, guides, etc. The electrical connections in the coupler head must also be refurbished. Rebuild procedures are provided by the OEM, but it is the responsibility of the Contractor to verify these procedures and propose changes as appropriate.

### **4. Articulation Wiring Harness Redesign and Replacement**

The control wiring on the rooftop connecting the two carbodies is in a high fatigue environment. Only the A-Car is fitted with bulkhead connectors. The jumpers are hard-wired into the B-Car. The task is to install bulkhead connectors on the B-Car, replace A-Car connectors, provide new jumpers, and design a cable support system that minimizes fatigue and chafing.

### **5. Trailer Truck Electric System Cable Assembly (PSC-2) Replacement**

The PSC-2 wiring harness is installed in the center truck, and connects the ATC antenna and tachometer signals to the carbody wiring system. This harness is subject to fatigue, damage from debris strikes, and general dirt, grease, and grime. A replacement cable must be installed.

All work must be performed at the Contractor's facility, and all logistics associated with transporting the LRVs between SFMTA shops and the Contractor's facility are the sole responsibility of the Contractor.

## SCOPE AND RESPONSIBILITIES

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Other Sections of these Technical Provisions define various aspects of the LRV operating environment, carbody design, propulsion equipment, materials and workmanship, quality assurance, testing, and documentation.

The LRV systems shall be designed and built/rebuilt to comply in all respects with all applicable laws, regulations, standards, and recommended practices of the following agencies and organizations:

- US Department of Transportation (USDOT)
- Federal Transit Administration (FTA)
- US Department of Homeland Security (DHS)
- American Public Transportation Association (APTA)
- State of California
- Environmental Protection Agency (EPA)
- National Fire Protection Association (NFPA)
- Occupational Safety and Health Administration (OSHA)
- OEM Maintenance Manuals

Where there is a conflict, the most restrictive requirement shall apply.

All integral systems and components shall embody the latest tested and service-proven developments and improvements available to the Contractor, as approved by the Engineer. All systems shall be designed in accordance with the Technical Provisions to meet or exceed all applicable safety standards, optimize reliability, promote energy conservation, minimize routine maintenance requirements, reduce the number of parasitic power losses, and minimize noise emissions.

This project, as with all SFMTA programs shall comply with all applicable current environmental regulations and work to embrace new regulations, standards, and technologies as they are developed and implemented. All work shall comply with regulations in place at the time of vehicle acceptance.

The Contract and Technical Provisions also include, but are not limited to, the provision of the following where applicable:

- Design Documentation
- Testing
- Manuals
- Training
- Special Tools, Test Equipment, and Apparatus
- Other required deliverables and services associated with the LRVs, complete with warranties and guarantees.

## SCOPE AND RESPONSIBILITIES

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Whenever a question arises regarding the requirements of the Contract Documents, the Contractor shall apply to the Engineer for further written explanations as may be necessary and shall conform to the explanations provided.

Notwithstanding the above, the Contractor shall not be relieved of the responsibility to comply with the latest rules, regulations, and standards applicable to this Contract and to ensure the suitability of the systems, devices, apparatus, components, and parts for the service intended.

### **B. Intent**

The Technical Provisions and referenced drawings describe the overall dimensions, shape, appearance, and functions of the cars, and the environment in which they will operate. Certain design details are given, where necessary, where experience has dictated a need to limit the Contractor's choice of materials or direct its design. Other details and clarifications have been defined for the benefit of prospective Contractors not familiar with North American standards and practices.

It shall be the sole responsibility of the Contractor to design, develop, and rebuild systems that are, in all respects, suitable for the purpose intended. If any part, device, or component is required to make the LRV function as specified, it shall be the Contractor's responsibility to provide that part, device, or component.

Although the required warranty is defined elsewhere in the Contract Documents, the design of the systems and the level of quality and durability of the LRV, its systems and components shall be consistent with minimum useful life of 30 years.

### **TP01.02 DEFINITIONS**

The definitions provided in this Section are meant to supplement and complement those included Volume I of these contract documents. Wherever the following terms are used in these Technical Provisions, the intent and meaning shall be interpreted as follows:

**A" BODY SECTION:** The half of an articulated car containing the pantograph.

**APPROVAL:** Review and acceptance, in writing, by the named party, typically the Engineer.

**APPROVED OR APPROVED TYPE:** Design, type of material, procedure, or method given approval by the Engineer.

**APPROVED EQUAL:** Whenever the words "approved equal" are used in connection with a specific manufacturer or item of equipment in the Technical Provisions, they shall be interpreted to mean that in order to substitute any other component for use in lieu of the specified component, the proposed substitute brand or make of material, device, or equipment must be approved in writing by the Engineer. The following areas shall be considered before requesting approval from the Engineer:

- Safety
- Quality

## SCOPE AND RESPONSIBILITIES

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- Workmanship
- Economy of Operation
- Life Cycle Cost
- Reliability
- Maintainability
- Interchangeability
- Suitability for the purpose intended

**ASSEMBLY:** The ordered arrangement of components that form the subset or complete set of parts that constitutes a system.

**AUXILIARY EQUIPMENT:** Any mechanism or structure, other than the vehicle body, traction motor, or propulsion equipment gearing, that performs a function at some time during the operation of the transit vehicle -- e.g., heating and cooling subsystem, pumps, static inverter, vehicle door mechanism, motor alternator or motor-generator set, air compressor or hydraulic power unit, transit vehicle lighting.

**AVAILABILITY:** The percentage of the car fleet useable for revenue service at the beginning of each day's schedule. Also on a per car basis, the percentage of time a car is useable for service:  $(MTBF) / (MTBF + MTTR)$ .

**"B" BODY SECTION:** The half of an articulated car not containing the pantograph.

**BASELINE DESIGN:** The design of the car or any of its components, apparatus, systems, subsystems, or materials which have received both drawing approval and first article approval.

**BURN-IN:** The operation of an item under stress to stabilize its characteristics.

**CAR:** See LIGHT RAIL VEHICLE

**CATENARY:** Overhead power supply consisting of a combination of conductors and other hardware suspended above the tracks by means of cantilevers and wayside structures. See also OVERHEAD CONTACT SYSTEM.

**COMMISSIONING:** Pre-acceptance Contractor activities involved in delivering, adjusting, and testing the cars to demonstrate compliance with the requirements of the Technical Provisions.

**COMMENT:** Written critiques of the Contractor's submittals to SFMTA.

**CONSIST:** The quantity and specific identity of vehicles that make up a train.

**CONSOLE:** The control panel located in the cab directly in front of the operator's seat.

**CONTRACT DATA REQUIREMENTS LIST (CDRL):** A matrix listing data, such as drawings, catalogs, reports, notices, and samples, required to be submitted by the Contractor. The matrix



## SCOPE AND RESPONSIBILITIES

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also shows when such submittals are required and resubmittal requirements and their frequency.

**CONTRACTOR:** A public company or conglomerate selected to provide SFMTA with a specified level of commuter rail service along four corridors. The Contractor will like provide commuter rail system financing, design, construction, operations, and maintenance through a long-term partnership with SFMTA. The Contractor will ultimately purchase, take delivery of, and own the specified commuter rail vehicles.

**CONTRACTOR'S DRAWINGS:** Items such as general arrangement drawings, detail drawings, graphs, diagrams, and sketches which are prepared by the Contractor to detail its work.

**CORRECTIVE MAINTENANCE:** Those actions performed, as a result of a failure, to restore an item to a specified condition.

**COUPLER:** A device for mechanically coupling transit vehicles together. This term is also applied to connectors, as in "electric coupler" and "pneumatic coupler."

**DEADMAN FEATURE:** A device to detect inattention or disability of a train operator, which causes a brake application.

**DELIVERY:** The transfer of the completed vehicle (with all in-plant testing completed and results accepted by SFMTA) to SFMTA property, ready for commissioning and acceptance testing.

**DRAFT GEAR:** The energy-absorbing mechanism that attaches the coupler to the anchorage.

**ENGINEER:** The individual designated by SFMTA to manage the technical aspects of the Contract on a day-to-day basis. The duly authorized representative acting, directly or through his duly authorized representatives, within the scope of the particular duties assigned.

**FAIL-SAFE:** Equipment configurations that are implemented in hardware where each component has a known set of predictable failure modes that may be individually analyzed for their effect on equipment performance and function. Any failure or set of failures resulting from a single causative event must cause the equipment to revert to a safe state that is self-annunciating. The probability of an unsafe state must be zero.

**FAILURE:** The inability of a component, system, or subsystem to function or perform in accordance with the Technical Provisions and requiring a corrective action to restore the specified function or performance.

**FAILURE PATTERN:** The occurrence of three or more failures of the same or identically replaceable Items (i.e., the same part number) within the lesser of 10,000 fleet hours of operation or 400,000 fleet miles of travel, in identical applications or functional modes.

**FAILURE RATE:** A measure of the mean rate at which items from the same application population fail. The failure rate is determined by dividing the total number of failures by the total number of life units expended by that application population during a particular measurement interval. The life units used within SFMTA are "miles".

## **SCOPE AND RESPONSIBILITIES**

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**FAILURE, SERVICE:** A Service Failure is a Component/System Failure that meets any one of the relevant failure criteria:

- The car is taken out of service at the start or en route to its destination due to a problem or failure that has occurred resulting in an unsafe condition, or due to a problem or failure which prevents the car from completing its mission.
- The car, after beginning its mission, continues to its final destination but with a problem or failure that renders it unacceptable for continued service.
- The car is unacceptable for service as determined by SFMTA due to a problem or failure that was detected prior to the start of the mission.

**FAILURE, TRAIN DELAY:** A Train Delay Failure is a component failure that causes a train a delay of more than 5 minutes and 59 seconds.

**FIRST ARTICLE:** The first unit of any production component of the car that is produced in accordance with approved drawings.

**FIRST ARTICLE INSPECTION (FAI):** An extraordinary inspection of a First Article, which accomplishes two purposes:

- Observation in three dimensions by the Engineer, the Contracting Officer, etc., to see what could be seen only on drawings up to that point. If the First Article Inspection is of a component that the Contractor is purchasing, rather than manufacturing, the First Article Inspection discloses details that were not previously visible. The First Article Inspection is usually the first point at which maintainability of the component can be evaluated, inasmuch as it is the first point at which relationships between elements can be discerned. The Engineer may approve the design that is revealed at the First Article Inspection, or may require changes in order that the component can meet the requirements of the Contract. The first article inspection can be performed only if the design drawings for the subject article have been approved by SFMTA.
- Establishes the level of the quality of workmanship that will be maintained for the balance of the components.

**FULL MAINTENANCE:** All servicing and repairs as required by the manufacturer's maintenance manuals, including cleaning and repairs due to accidents.

**GAUGE, TRACK:** The distance between the inside face of rails, usually measured 5/8 inch below the top of the centerline of heads of running rails and at a right angle thereto.

**GENERAL TERMS:** Whenever the words "acceptable," "approved," "submitted," "designated," "established," "permitted," "required," "satisfactory," "suitable," "unacceptable," "unsatisfactory," or "unsuitable" are used they shall be understood to imply "by SFMTA" or "to SFMTA" unless the context clearly indicates a different meaning. Whenever the verbs "submit," "designate," "notify," "bear," "use," "furnish," "install," "comply," and other like verbs are used, without being preceded by a subject, it shall be understood that the subject is the Contractor and the action is to be the responsibility of the Contractor unless the context clearly indicates a different meaning.

## SCOPE AND RESPONSIBILITIES

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HIGH VOLTAGE: See PRIMARY POWER

INDICATED: As described in the Specifications, or as required by the other contract documents.

INSPECTOR: The person or firm designated by SFMTA as its quality assurance representative.

INTERCHANGEABLE: A condition where two or more modules of similar or different design perform identical functions and have identical interface characteristics.

INTERFACE: The points at which two or more systems, subsystems, or structures meet, transfer energy, or transfer information.

ITEM: A non-specific term used to denote any portion of the vehicle or car, including software. The Item Levels used by SFMTA from the simplest to the more complex are as follows: part, component, assembly, subsystem, system, and car.

INTERLOCK: A condition whereby one function is dependent on the operation of another function.

LEAD CAB: The controlling cab in a consist.

LEAD CAR: In the direction of travel, the forward-most car of the consist.

LEFT HAND: Left side of the transit vehicle when one looks toward the operator's end from inside the vehicle.

LIGHT RAIL VEHICLE: A light rail car whose configuration and performance are described by these specifications.

LINE REPLACEABLE UNIT (LRU): A unit which is designated by the maintenance plan to be removed upon failure from a larger entity (assembly, subsystem, system or car) and replaced to return the car to a serviceable condition.

LOWEST LEVEL REPLACEABLE UNIT (LLRU): The lowest LRU which is designated by the maintenance plan to be removed upon failure from a larger entity (assembly, subsystem, system or car) and replaced to return the car to a serviceable condition.

LOAD WEIGHING: A function that measures transit vehicle weight to permit control of tractive effort in order to achieve a constant effort-to-weight ratio.

LOW VOLTAGE: The voltage used for most auxiliary equipment on the vehicle, usually between 24 and 72 volts DC or 110 to 240 volts AC.

MASTER RESOLUTION LIST: Master list of engineering resolutions during design review.

MAINTAINABILITY: A measure of a vehicle's ability to be properly maintained, taking into account the ease and frequency of maintenance tasks, ability to efficiently use applied labor, and accessibility of equipment to be maintained by the maintenance staff.

## SCOPE AND RESPONSIBILITIES

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**MAINTENANCE, ACTIVE (AM):** All tasks associated with the troubleshooting and isolating of a Failure or problem down to a single faulty item that must be repaired, replaced, or temporarily disabled.

**MAINTENANCE, CORRECTIVE (CM):** All tasks associated with the restoration of an item to an operational status due to an unscheduled event, such as failure, accident, damage, act of nature, or similar event, or other maintenance tasks that must be done.

**MAINTENANCE, PREVENTIVE (PM):** All maintenance tasks associated with the performance of scheduled activities to cars, subsystems, equipment or facilities. This activity may consist of Servicing and Inspections (S&I), Life Cycle Maintenance (LCM), equipment overhaul, or functional checks of operating systems.

**MAINTENANCE, RESTORATION (RM):** All tasks associated with the restoration of an item to an operational status following Active Maintenance (AM), including removing and replacing the faulty item, and performing functional checkout to verify the restoration to operational status.

**MAINTENANCE TIME, ACTIVE (TAM):** The summation of elapsed time in person-hours actively expended during Active Maintenance after the car has been appropriately located and all tools and parts are on-hand at the work location.

**MAINTENANCE TIME, CORRECTIVE (TCM):** The summation of Active Maintenance Time (TAM) and the Restoration Maintenance Time (TRM).

**MAINTENANCE TIME, RESTORATION (TRM):** The summation of elapsed time in person-hours actively expended during Restoration Maintenance after a car has been appropriately located for the work to be performed and all tools and parts are on-hand at the work location.

**MEAN DISTANCE BETWEEN FAILURES (MDBF):** A measure of reliability of a car expressed as the mean operating distance mileage traveled between relevant delays.

**MEAN DISTANCE BETWEEN COMPONENT FAILURE (MDBCF):** A measure of reliability of an item expressed as the mean operating mileage traveled between all relevant component failures.

**MEAN DISTANCE BETWEEN SERVICE FAILURES (MDBSF):** A measure of reliability of an item expressed as the mean operating mileage traveled between all relevant service failures.

**MEAN TIME BETWEEN FAILURES (MTBF):** A measure of reliability of a car expressed as time durations between relevant failures.

**MEAN TIME TO REPAIR (MTTR):** A measure of maintainability defined as the time required to restore a car system or car to proper operating condition.

**MICROPROCESSOR:** All embedded systems, digital signal processors, and microcontrollers.

**MILEAGE, OPERATING:** The total distance traveled by the car during scheduled and unscheduled movements over established routes as recorded by SFMTA.

## SCOPE AND RESPONSIBILITIES

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**MISSION:** A one-way trip from the beginning terminal to the destination terminal as defined by SFMTA.

**MULTIPLE UNIT:** Two or more cars.

**NO-MOTION:** The status of the car when the velocity is less than a nominal 1 mph. The no-motion status shall be lost when the train is accelerated above a nominal 3 mph.

**NOISE:** Sound pressure level (SPL) or sound level as defined in ANSI Standards S1.2 and S1.13.

**NORMAL OPERATING CONDITIONS:** The actual conditions the cars shall be subject to within the SFMTA operating environment. Normal Operating Conditions includes revenue service, non-revenue service, daily inspections, periodic inspections and powered down storage.

**OPERATOR:** Individual on board who is responsible for train operation in manual modes and for overseeing train operation in the automatic mode.

**OVERHEAD CONTACT SYSTEM (OCS):** A system of overhead contact and support wires used to supply electrical power to LRV trains.

**PANTOGRAPH:** A device used for current collection from a catenary system. It consists of a dual-strip electrical collection shoe carried by a collapsible and adjustable frame.

**PERFORMANCE:** The measure of output or results obtained by a component, system, person, team, and so forth, as specified.

**PRIMARY POWER:** High-voltage DC power supplied to the transit vehicle via the interface between the current collector and the overhead contact wire.

**PROPERTY:** A transit agency or system.

**READY-TO-RUN (RTR):** A complete car, fully equipped and outfitted for passenger service.

**REDUNDANCY:** The existence of more than one means of accomplishing a given function.

**RELIABILITY:** The probability of a component, system, or car performing a specified function without failure and within design parameters, for the period of time intended, under normal operating conditions.

**REQUIREMENTS:** The criteria that must be met in designing the transit vehicle.

**REVENUE SERVICE:** Service on routes established for train use by the public.

**RIGHT HAND:** Right side of the transit vehicle when one looks toward the operator's end from inside the vehicle.

**ROLL, BODY:** The number of degrees in an area, having its base at top-of-rail height and at the centerline of the track, swept by a point in the center of the roof as the vehicle sways from side to side during normal running at any speed on level tangent track.

## SCOPE AND RESPONSIBILITIES

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**SAFETY CRITICAL:** Any condition, event, operation, process, component, assembly, subsystem, or system, the failure or malfunction of which can result in severe injury, severe occupational illness, or major damage.

**SFMTA-SUPPLIED EQUIPMENT:** Equipment furnished by SFMTA to the Contractor for installation in or on the transit vehicle.

**SERVICE PROVEN:** Car Components, Assemblies, Subassemblies or Systems which offer a demonstrated history of satisfactory performance defined by SFMTA in commuter rail service with a high level of availability under duty cycle and environmental conditions similar to those encountered in SFMTA operations.

**SHIPMENT:** The physical departure of the car from the Contractor's facility to SFMTA.

**SHOP DRAWINGS:** Drawings or sketches prepared by the Contractor for use in its manufacturing or other activities.

**SLIDE, WHEEL:** The condition in which the equivalent linear velocity of the wheel is less than the linear velocity of the transit vehicle.

**SPECIFICATIONS:** The directions, provisions, and requirements contained or referred to herein, together with all written agreements made, or to be made, that pertain to the manner of performing the work, or the quantities of work and materials, to be provided under the contract.

**STANDARD TRAIN:** For performance test purposes, a specific consist size, configuration, and load.

**SUBSYSTEM:** A portion of a System defined in the Technical Provisions and refined in the design process consisting of Parts, Components and/or Assemblies.

**SYSTEM:** A set of subsystems, assemblies and components that provide the functions as described in sections TP01 through TP26 of the Technical Provisions.

**TRACTIVE EFFORT:** The horizontal force that is measured at the wheel-rail interface.

**TRACTIVE EFFORT SIGNAL:** Linear analog signal that effects continuous proportional control of the tractive effort.

**TRAINLINE:** The means of sending a signal to all transit vehicles in a consist via a continuous electrical or fluid circuit connected through appropriate coupling devices.

**TRAM:** A condition of ideal truck geometry in which the axles are perfectly parallel and the wheels longitudinally in perfect alignment. The centers of the journal bearings represent the corners of a perfect rectangle. Tram is checked by measuring the diagonal and longitudinal distances between reference points on the axle bearing housings.

**VITAL:** A function or a unit which is critical to overall system safety and which, if not designed, processed, or treated correctly, may cause a hazard. The probability of an unsafe failure must be statistically inconsequential.

## SCOPE AND RESPONSIBILITIES

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**WATERPROOF:** The design, construction, and/or treatment of a device, component, apparatus, or structure that allows the device, component, apparatus, or structure to operate or function normally with its intended level of reliability for the duration of its design life without detrimental effect from the presence of moisture or water resulting from leakage or condensation in its operating or functional environment.

**WATERTIGHT:** The design, construction, and/or treatment of a device, component, apparatus, or structure that precludes the entrance of moisture or water into that element under any and all operating, maintenance, servicing, and test conditions for the life of the device, component, apparatus, or structure.

**WARRANTY CLAIM REVIEW BOARD (WCRB):** Representatives from both the Contractor and SFMTA who as formal participants determine the need for and depth of failure analyses and corrective actions. The WCRB shall also classify failure types.

**WEATHERPROOF:** The design, construction, and/or treatment of a device, component, apparatus, or structure shall be able to withstand any and all exposure to all weather conditions without damage or malfunction.

**WEIGHTS, ACTUAL:** The measured weights of finished transit vehicles ready to run.

**WEIGHTS, ASSIGNED:** The loaded transit vehicle categories assigned as the basis for system design and for subsystem and transit vehicle testing. Four weight categories are assigned:

AW0 Empty transit vehicle weight

AW1 Empty transit vehicle weight plus passenger seated load

AW2 Empty transit vehicle weight plus passenger seated and normal rated standing load

AW3 Empty transit vehicle weight plus passenger seated and full rated standing load.

**ZERO SPEED:** Vehicle velocity of less than 2 mph for more than 1 second.

### TP01.03 ABBREVIATIONS

The abbreviations provided in this Section supplement and complement those included in the General Provisions. The following is a list of abbreviations used in the Technical Provisions. The list is provided as information and is neither intended to be all inclusive nor are all abbreviations necessarily used herein.

AAR	Association of American Railroads
AATCC	American Association of Textile Chemists and Colorists
AC	Alternating Current
ACL	Access Control List
ADA	Americans with Disabilities Act of 1990 as amended.
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMP	Amperes
ANSI	American National Standards Institute
APS	Auxiliary Power Supply
APTA	American Public Transportation Association
APU	Auxiliary Power Unit

## SCOPE AND RESPONSIBILITIES

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AREA	American Railway Engineering Association
AREMA	American Railway Engineering and Maintenance of Way Association
ASC	Automatic Speed Control
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATCS	Automatic Train Control System
ATS	Automatic Train Stop
AWG	American Wire Gauge
AWS	American Welding Society
BIL	Basic Insulation Level
BNC	Baby "N" Connector
BTE	Bench Test Equipment
BTL	Battery Trainline
C	Degree Celsius
CDB	Degrees Celsius Dry Bulb
CWB	Degrees Celsius Wet Bulb
C	Capacitance
CAD	Computer Aided Design
CDRL	Contract Deliverable Requirement List
CER	Critical Engineering Review
cfm	Cubic Feet per Minute
CM	Corrective Maintenance
CMP	Configuration Management Control Plan
CN	Car Network
CNC	Car Network Controller
COTS	Commercial Off The Shelf Software
CPM	Critical Path Method
CQP	Contract Quality Plan
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CRF	Critical Radiant Flux
CS	Communication System
CSS	Cab Signal System
DAU	Data Acquisition Unit
dB	Decibel
DB	Dry Bulb
dBA	Decibel, A-Weighted Scale
DBU	Disc Brake Unit
DC	Direct Current
DCN	Data Car Network
DCS	Door Control System
D <sub>s</sub>	Specific Optical Density
DTN	Data Trainline Network
E	Modulus of Elasticity
ECR	Engineering Change Request
ECU	Electronic Control Unit
EEPROM	Electrically Erasable Programmable Read Only Memory
EIA	Electronic Industries Association
EMC	Electromagnetic Control
EMCP	Electromagnetic Compatibility Plan



## SCOPE AND RESPONSIBILITIES

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EMI	Electromagnetic Interference
EP	Electro Pneumatic
EPIC	Electro-Pneumatic Integrated Control
EPROM	Erasable Programmable Read-Only Memory
ERTIS	En-Route Transit Information System
ESD	Electrostatic Discharge
F	Degrees Fahrenheit
FDB	Degrees Fahrenheit Dry Bulb
FWB	Degrees Fahrenheit Wet Bulb
FAI	First Article Inspection
FBCU	Friction Brake Control Unit
FAP	Frequency Allocation Protocol
FAR	Federal Acquisition Regulations
FCC	Federal Communications Commission
FDA	Food and Drug Administration
FEA	Finite Element Analysis
FMECA	Failure Mode Effects and Criticality Analysis
FTA	Federal Transit Administration
fpm	Feet Per Minute
FRACAS	Failure Reporting and Corrective Action System
FRP	Fiberglass Reinforced Plastic
g	Gravitational Acceleration
GP	General Purpose
GPS	Global Positioning System
GTO	Gate Turn-Off
HAZ	Heat Affected Zone
HCFC	Hydrochlorofluorocarbon
HDLC	High Level Data Link Control
HEP	Head End Power
HFC	Hydrofluorocarbon
HP	Horsepower
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz
I/O	Input/Output
IC	Integrated Circuit
ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IEM	Interactive Electronic Manual
IES	Illuminating Engineering Society
IFD	Indentation Force Deflection
IGBT	Insulated Gate Bipolar Transistor
IPC	Institute of Printed Circuits
IPS	Iron Pipe Size
ISO	International Standards Organization
I <sub>s</sub>	Flame Spread Index
JEDEC	Joint Electronic Device Engineering Council
KHz	Kilohertz
kVA	Kilovolt Ampere
kW	Kilowatt

## SCOPE AND RESPONSIBILITIES

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LAN	Local Area Network
LAHT	Low Alloy High Tensile Strength (Steel)
lb	Pounds
lbf	Pounds Force
LCD	Liquid Crystal Display
LCTS	Local Diagnostic and Test System
LED	Light Emitting Diode
LRU	Line Replaceable Unit
LLRU	Lowest Level Replaceable Unit
LVDB	Low Voltage Distribution Bus
LVDN	Low Voltage Distribution Network
LVPS	Low Voltage DC Power Supply
MC	Master Controller
MDBF	Mean Distance Between Failure
MDS	Monitoring and Diagnostics System
MDU	Maintenance Display Unit
MHz	Megahertz
MIL	Military Specification
mph	Miles Per Hour
mphps	Miles Per Hour Per Second
mphpsps	Miles Per Hour Per Second Per Second
MRB	Material Review Board
MS	Margin of Safety
ms	Millisecond
MS-DOS	Microsoft Disc Operating System
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
MU	Multiple-Unit
ΦA	Micro Ampere
NBS	National Bureau of Standards
NBR	Net Braking Ratio
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NFL	No Field Lubrication
NFPA	National Fire Protection Association
NTP	Notice to Proceed
OD	Outside Diameter
ODK	Operator's Display Keyboard
OEM	Original Equipment Manufacturer
OHDS	Overhead Heat Duct Sensor
OSHA	Occupational Safety and Health Administration
PA	Public Address
PC	Printed Circuit
PCB	Printed Circuit Board
PCMCIA	Personal Computer Memory Card International Association
PCU	Pneumatic Control Unit
PDE	Portable Diagnostic Equipment
PEI	Passenger Emergency Intercom
PER	Preliminary Engineering Review
PFC	Pulling Face of Coupler

## SCOPE AND RESPONSIBILITIES

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PHA	Preliminary Hazard Analysis
PIV	Peak Inverse Voltage
PLDS	Passenger Load Determination System
ppm	Parts Per Million
PROM	Programmable Read-Only Memory
PS	Pressure Switch
psi	Pounds Per Square Inch
psia	Pounds Per Square Inch, Absolute
psig	Pounds Per Square Inch, Gauge
PTE	Portable Test Equipment
PTFE	Polytetrafluoroethylene
PTS	Positive Train Separation
PTU	Portable Test Unit
PWM	Pulse Width Modulation
QA	Quality Assurance
R-C	Resistive-Capacitive
RAM	Random Access Memory
RFI	Radio Frequency Interference
RH	Relative Humidity
rms	Root Mean Square
ROM	Read-Only Memory
rpm	Revolutions Per Minute
SAE	Society of Automotive Engineers
SBCO	Service Brake Cutout
SCCO	Speed Control Cutout Switch
SCE	Software Capability Evaluation
scfm	Standard Cubic Feet Per Minute
SCI	Software Configuration Item
SCR	Silicone Controlled Rectifier
SCS	Speed Control System
SDD	Software Design Description
SDU	Speed Display Unit
SFMTA	San Francisco Municipal Transportation
SIC	Standard Industrial Code (U.S. Department of Labor)
SPL	Sound Pressure Level
SSP	System Safety Program
S&I	Service and Inspection Facility
S/N	Signal-to-Noise Ratio
T <sub>s</sub>	Ambient Temperature
T <sub>i</sub>	Interior Temperature
TBU	Tread Brake Unit
TDMS	Train Data Monitoring System
TFE	Tetrafluoroethylene
TIG	Tungsten Inert Gas
TIR	Total Indicated Runout
TLDS	Train Level Diagnostic System
TN	Train Network
TOR	Top-of-Rail
TWC	Train-to-Wayside Communications
TXV	Thermal Expansion Valve

## SCOPE AND RESPONSIBILITIES

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UA-Factor	Total Carbody Heat Transmission Value
UL	Underwriters Laboratories Inc.
UN	Unit Network
UNC	Unified National Coarse (Thread)
UNF	Unified National Fine (Thread)
URL	Uniform Resource Locator
US	United States
USASI	United States of America Standards Institute
USB	Universal Serial Bus
USDOT	United States Department of Transportation
UV	Ultraviolet
V AC	Volts, Alternating Current
V DC	Volts, Direct Current
VMU	Vehicle Monitoring Unit
VOM	Volt/Ohm Meter
VPI	Vacuum Pressure Impregnation
Vp-p	Voltage peak-to-peak
VSWR	Voltage Standing Wave Ratio
W	Watt
WB	Wet Bulb
WCRB	Warranty Claim Review Board
WMDS	Wayside Monitoring and Diagnostic Systems
WPS	Weld Procedure Specifications

### TP01.04 RESPONSIBILITIES OF THE CONTRACTOR

#### A. General

The Contractor shall submit a complete Master Program Schedule to the Engineer for review and approval no later than 60 days after Notice to Proceed (NTP) and provide monthly updates thereafter as outlined in Section 1.04J of these Technical Provisions [CDRL 1-001].

With respect to the five systems being rebuilt or replaced, the Contractor shall be directly and exclusively responsible for the proper interrelational functioning and system integration. The Contractor shall perform all necessary detail and design work required for any new system elements, and shall prepare all necessary detail drawings, design calculations, other specified technical documentation, and Contract-required submittals. The Contractor shall submit such additional or revised drawings, diagrams, calculations, test results, and demonstrative evidence as the Engineer deems necessary to confirm the completeness and accuracy of Contractor's submittal. See individual work scope sections for specific CDRL items.

Copies of Purchase Orders (which may have prices deleted) and revisions to purchase orders for all major items of equipment, as determined by the General Provisions, shall be submitted to the Engineer on an ongoing basis, no less frequent than every 30 days [CDRL 1-002].

## SCOPE AND RESPONSIBILITIES

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### **B. Drawings and Other Relevant Documents**

#### **1. SFMTA-Supplied Drawings and Manuals**

SFMTA will make existing system drawings and maintenance manuals, prepared by the vehicle manufacturer (Ansaldo Breda) and their sub-suppliers. It is the responsibility of the Contractor to verify the accuracy of these documents.

#### **2. Contractor's Drawings and Manuals**

The Contractor shall develop and submit to the Engineer for review and approval detailed design of any system or component that is intended to replace existing systems or components. Any new manuals or modifications to existing manuals to reflect the new system configuration shall be submitted for review and approval. See individual work scope sections for specific CDRL items.

### **C. Design Approval**

#### **1. General**

The Contractor shall conduct formal design review meetings with the Engineer for any new design elements. The purpose of these meetings will be to ensure that the requirements of the Technical Provisions are met by the design. The schedule for design review meetings shall be included in the Master Program Schedule. A minimum of two reviews, preliminary and final, shall be conducted. With approval of the Engineer, the design review process may also incorporate the drawing review approval process.

The Contractor shall not release any design for manufacture before the approval of the final design by the Engineer. Approval of a design by the Engineer shall not relieve the Contractor of responsibility for the design and construction of the cars to comply with all requirements of the Contract.

### **D. Reports**

The Contractor shall submit the required reports and submittals in compliance with the format and content specified throughout these Technical Provisions. If a cited reference is not readily available to SFMTA, the Contractor shall provide the reference or copies of the pertinent pages. All references shall be in English. If an English reference cannot be found, an English translation shall be provided, and both the original and the translation shall be included in the report.

### **E. First Article Inspection (FAI)**

As a minimum, the Contractor shall perform First Article Inspections (FAIs) on each rebuilt system or new/replacement system. See individual work scope sections for specific FAI CDRL items. Multiple FAIs must be performed to demonstrate the various unique door/step systems by location and car type.

## **SCOPE AND RESPONSIBILITIES**

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First Article Inspections shall also evaluate component and system maintainability. FAIs shall be performed only on components built using approved production processes and tooling, and shall establish the standard of quality of workmanship for the balance of like components.

SFMTA shall have the option of witnessing any or all FAIs.

In the event the Contractor schedules Type (Qualification) Testing immediately preceding an FAI or in conjunction with the FAI, the Type Test Procedures shall be submitted to the Engineer for review and approval no less than 30 days prior to testing.

Prior to conducting any Routine (Production) Tests, the Contractor shall have conducted and successfully passed the corresponding Type Tests, and received approval of the Test Report from SFMTA.

An FAI will not be approved by the Engineer until the requisite Type Test and Routine Test are completed and approved by the Engineer.

### **F. Quality Assurance**

An audit of the Contractor's Quality Assurance Program may be conducted by SFMTA and/or the Engineer prior to issuance of the Purchase Order. The Contractor shall establish and maintain a Quality Assurance (QA) program as described in TP09 and in compliance with ISO-9001 or ANSI/ASQC-Q91 or equivalent. The program shall ensure compliance with the requirements of the Contract and shall include provisions for ensuring Contract compliance by subcontractors, suppliers, and manufacturers.

Work undertaken by the Contractor or any of its subcontractors or suppliers before review and approval of the QA Program by the Engineer will be at the Contractor's risk and expense. The Contractor's approved QA Program shall not be changed without the approval of the Engineer. Work undertaken by the Contractor before receipt of written approval from the Engineer will be at the Contractor's risk and expense.

The implementation of any aspect of the Contractor's operation as it relates to Quality Assurance or the QA Program shall be subject to verification by the Engineer at any time. Verification shall include, but not be limited to: audit of the quality assurance program; surveillance of the operations to determine that practices, methods, and procedures of the program are being properly implemented; inspection to measure the quality of items offered for acceptance; and inspection of items prior to release for shipment to ensure compliance with requirements of the Contract. These requirements do not imply that the SFMTA Inspector or the Engineer will be considered a level of Quality Assurance for the Contractor.

Failure by the Contractor to promptly correct deficiencies following notification by the Engineer may be cause for suspension of the work until corrective action has been taken or until conformance of items to prescribed criteria has been demonstrated to and approved by the Engineer.

## SCOPE AND RESPONSIBILITIES

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### G. Testing

The Contractor shall perform or arrange for the performance of all tests listed in TP10. No test shall be conducted without prior approval of the procedure for such test. If the Contract Documents, laws, ordinances, rules, regulations, and orders of any public authority having jurisdiction require any portion of the procurement process or products to be inspected, tested, and approved, the Contractor shall:

### H. Subcontracts

### I. Master Program Schedule

The Contractor shall develop and submit a Master Program Schedule for review and approval no later than 60 days after NTP. The program schedule shall identify all milestones, the earliest and latest possible dates for accomplishing each milestone, the shortest and longest permissible time span between each dependent milestone, and major and minor paths which are critical for accomplishment of program objectives. The initial baseline schedule shall be maintained for the duration of the contract for review. A complete CDRL list with proposed delivery dates shall also be provided.

The Master Program Schedule shall be monitored and controlled by the Contractor's management team responsible for all management functions and shall be updated and submitted to the Engineer for review and approval at least monthly for the duration of the project.

## TP01.05 DRAWINGS

### A. Approval Drawings

While it is recognized that most of the drawings required for this project exist, the Contractor, in compliance with the approved Master Program Schedule, shall submit in electronic form to the Engineer for review and approval each new drawing required by the Technical Provisions or necessary to demonstrate compliance with the Technical Provision requirements. Each drawing shall be provided as an AUTOCAD 2000 drawing with \*.DXF or \*.DWG file extensions or other format as approved by the Engineer. Review and approval of the Contractor's submittals shall be attained before beginning any manufacture. Sufficient drawings shall be submitted to convey concept, design, dimensions, operation, maintenance, overall assembly, and interfaces for any new design work. Detailed part drawings shall be submitted for any new assemblies, as well as arrangements and details of all apparatus, including apparatus within equipment boxes. Outline or incomplete drawings will not be acceptable. These conditions shall also apply to subcontractor-furnished material and components [CDRL 1-010].

The Contractor shall provide an indexed drawing database listing all drawings in an electronic format in Microsoft Excel or approved equal, containing information on all drawings. The database shall include the builder's and manufacturers' drawing numbers and shall be arranged in ascending order and embody the following information:

Drawing Size

Electronic File

Blank (SFMTA use)

## SCOPE AND RESPONSIBILITIES

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Drawing Number	Location	
Revision Number	System	System Identity
Issue Date	Number of Sheets	Drawing Title
	Company Name	Revision Date

This database file shall be uploaded to the Project Extranet. This database shall be continuously maintained and kept current [CDRL 1-011]. The database shall be compatible with the capabilities of the Extranet in that by accessing the database on the Project Extranet, the user shall be able to search the database in a variety of linear and non-linear ways, depending on the user's starting point. The user shall be able to browse the database and search for files by system, manufacturer, drawing title (both by keyword and text string) and, drawing number. When the desired drawing file is located, the user shall be able to locate and view the electronic file within the Project Extranet. The Project Extranet shall also contain all other project related documentation such as letters and submittals.

Within 60 days after NTP, the Contractor shall submit to the Engineer a fully functioning database with all capabilities described above for review and approval. The database shall represent all drawing types and shall be subject to Engineer approval.

The Engineer will review all drawings submitted. All submitted drawings will be documented as Approved, Conditionally Approved, or Disapproved, along with appropriate comments. The Engineer will formally document the status of each drawing within 30 calendar days of the date the drawing is electronically transferred to the Project Extranet. The Contractor shall not proceed with procurement or manufacture of systems or components until the respective drawings have been approved unless specifically authorized to do so by the Engineer in writing. If the Contractor chooses to proceed regardless of approval or authorization by the Engineer, it shall do so at its own risk.

Conditionally Approved and Disapproved drawings shall be resubmitted by the Contractor after revision for review and approval by the Engineer. All details of drawings affected by any change shall be highlighted when resubmitted to the Engineer for review and approval.

Drawings submitted by subcontractors or suppliers shall be thoroughly reviewed and approved by the Contractor to ensure that they meet Contract Documents (as to form, fit, and purpose) and the Technical Provisions requirements before submittal to the Engineer for review and approval.

### **B. Submittal Form**

All submissions shall be properly referenced to clearly indicate the location, service, and function of each particular subject, and shall include the proper references to the appropriate Technical Provisions section including drawing numbers and details. Where the manufacturer's publications, in the form of catalogs, pamphlets, or other data sheets, are submitted in lieu of prepared shop drawings, such submissions shall specifically indicate the item for which approval is requested. Identification of items shall be made in ink. Submissions showing only general information will not be acceptable.



## SCOPE AND RESPONSIBILITIES

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The dimensions on all drawings shall be expressed in the English system; the wording on all drawings shall be in the English language. All terminology used on drawings and in correspondence shall be conventional to the North American railroad industry. Where temperatures are expressed in both Fahrenheit and Celsius, the value in parentheses is for reference only; compliance with the Technical Provision shall be measured in terms of the value first stated, whether Fahrenheit or Celsius.

Drawings shall be made to the third-angle projection system. All submitted drawings shall be full size to the scale specified on the drawings. Reduced size copies will not be permitted. Every drawing shall include a complete bill of material and parts list in the field of the drawing or on a separate sheet of the same drawing. All parts or subassemblies, including subcontractor-furnished items, which form a part of the assembly, subassembly, or piece depicted, shall be described. All drawings shall reference the number of the drawing of the next higher subassembly or assembly on which it is used. This requirement does not apply to standard hardware or electrical and electronic components. Final drawings shall be of not more than four standard sizes, with "D" size as the largest drawing permissible size. "E"-size drawings shall be used only during design reviews.

Revisions to drawings and drawing change orders affecting previously submitted drawings shall be re-submitted for approval as they are issued. No more than three revisions shall remain unincorporated on any drawing at any time.

Drawings on which changes have been made, even though less than three, shall be revised to incorporate those changes no less frequently than at 60 day intervals. The revision block shall describe the details of the changes made by that revision, or, in lieu of detailed descriptions, the numbers of the applicable drawing change orders may be used. In the latter case, the drawing change orders shall have been submitted no later than the time of submittal of the revised drawing. The details of all changes shall be highlighted on the drawing(s) sent to the Engineer for review and approval. Alternate methods shall be subject to approval by the Engineer.

Approval of a drawing does not relieve the Contractor of its obligation to meet all requirements of the Contract. Approval of a drawing which contains a deviation from, or breach of, the Technical Provisions does not constitute authority for that deviation or breach unless such deviation has been specifically requested in writing and approval granted in writing according to Contract requirements separate from the drawing approval process.

All requests for deviations from approved drawings shall be submitted, reviewed, and approved by the Engineer prior to release of the drawing for installation.

Each Engineering Change, Deviation, Material Review Board (MRB) repair, or similar variance affecting form, fit, or function shall be incorporated on the affected drawings when it applies to two or more cars of LRV design. Such drawings shall be clearly labeled with the SFMTA car numbers that apply to each configuration. Those variances applying to fewer than four cars may also be incorporated on the affected drawings or the variances may be furnished separately. If furnished separately, they shall also be described in the Car History Book (TP01.06) for each car involved with cross reference to the affected drawings.

## SCOPE AND RESPONSIBILITIES

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If the Contractor's drawing system is such that drawings of details are not included in assembly, sub-assembly, and arrangement drawings as described above, the Contractor shall submit copies of all detail drawings to the Engineer. The Contractor shall maintain all drawings for a period of 30 years. The Contractor shall make available, without charge, for a minimum of five years from the date of acceptance of the last car, drawings of any details required for extraordinary repairs arising from accidents or mandated or unanticipated changes. During the remaining 25 years of drawing availability, SFMTA shall be provided with all requested drawings at cost.

The submittal of electronic files of all drawings, letters, attachments, CDRL's, and other documents shall be via the Project Extranet. The Project Extranet shall be a designated URL address on the World Wide Web (www) to which all submittals to the Engineer will be uploaded. All electronic transmittals from SFMTA or the Engineer to the Contractor will be via the Project Extranet.

### C. Contract Drawings

The Contractor shall submit to the Engineer for review and approval, within 60 days after completion of the first car, upon completion of the last car, and then again after completion of all modifications, a list of all "as-built" drawings to be supplied in accordance with this Section. The as-built drawings shall include one set of hard-copy prints and two sets of electronic media files, supplied on CD-ROM in AUTOCAD 2000 (\*.DXF, \*.DWG) format or approved equal of the following drawings **[CDRL 1-013]**:

1. Drawings of any new assemblies, subassemblies, and changes to arrangements of the cars, as finally manufactured and modified.
2. All detail drawings of those assemblies, subassemblies, and arrangements.
3. A complete indented bill of material for all assemblies, subassemblies, and arrangements for systems that have changed.
4. If necessary, a revised final integrated electrical schematic, wiring diagram, and wire list defining all wiring and electrical apparatus.
5. All approved detailed Contractor and subcontractor drawings.

The as-built drawings shall incorporate all engineering and manufacturing changes. Deviations shall also be incorporated, with copies provided in a separate indexed section.

The Contractor shall provide to the Engineer and SFMTA, at no additional cost, at any time requested prior to delivery of the reproducible drawings, working drawing prints in electronic files to enable the maintenance staff to maintain, service, and repair the cars. The Contractor shall also provide the Engineer, within 60 days after delivery of the first vehicle, a list of all drawings to be supplied to the Engineer and SFMTA which may be needed to perform extraordinary repairs **[CDRL 1-014]**.

The electronic version of the Contract drawings shall be provided in an AUTOCAD or approved equal format that allows the maintenance staff to update the drawings to

## **SCOPE AND RESPONSIBILITIES**

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incorporate enhancements and product improvements developed after completion of the work and warranty period.

### **TP01.06 CAR HISTORY BOOKS**

The Contractor shall furnish to SFMTA electronic and paper copies of pages to be added to existing Car History Books per car at the time of issuance of an Approved for Revenue Service Certificate for each LRV. Updates must be made to the following sections as appropriate based on the work performed:

1. Car Number.
2. Written report of each test performed on the car and its apparatus.
3. Serial numbers of all required components.
4. All approved contract changes, engineering changes, and deviations incorporated into the car which are not incorporated on all cars.
5. All modifications to the car that are not incorporated on all the other cars. Repair, rework and modifications that are specific to one or more cars but not to all cars.
6. List of all MRB repairs applying to the car.
7. Copy of each test report log sheet for all tests performed on equipment on the car and the car.
8. Any other information required by the Technical Provisions to be in the Car History Book.

The Car History Books shall be kept up-to-date by the Contractor and shall record all changes, retrofits, and additions made to each car until completion of the base warranty period [CDRL 1-015].

### **TP01.07 INTEGRATED MANAGEMENT PLAN**

#### **A. General**

The Contractor shall develop a Management Program Plan per requirements in this section with adequate details even if the specifics are not identified herein. This applies to but is not limited to all correspondence, Schedule, meetings, systems engineering/integration, configuration control, Weight Control Program, inspections, testing, compliance with regulations/requirements/codes, Quality Assurance/Quality Control (QA/QC) Program, Safety Program, Submittals, Acceptance, and Warranty.

Upon written request by the Contractor, SFMTA shall make the drawings and schematics for the vehicles available to the Contractor. SFMTA does not guarantee nor confirms the accuracy of these documents and the Contractor shall thoroughly inspect the vehicles to verify the accuracy of the drawings. For all such inspection and verification activities, the Contractor shall provide a written request at least one (1) week prior to the inspection date.

## SCOPE AND RESPONSIBILITIES

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### **B. Pre-Bid LRV Inspections**

The Contractor shall be given opportunity to review selected LRVs in the SFMTA's maintenance facility prior to bidding. Based on these inspections, the Contractor shall assess the vehicle conditions. Any issues, discrepancies, and problems noticed during this inspection shall be promptly brought to the SFMTA's attention. Based on the significance of the findings, the SFMTA may choose to issue an addendum to this RFP.

### **C. Correspondence and Communications**

The Contractor shall submit all communications in writing on letterhead to the SFMTA. Verbal and informal communications shall not be considered contractually binding. All contractual documents shall be mailed to the address below:

Attention: TBD  
San Francisco Municipal Transportation Agency (SFMTA)  
1 South Van Ness Avenue, 7th Floor  
San Francisco, CA 94103

For CDRLs, one (1) original and six (6) copies shall be sent to the address identified above. Special arrangements shall be made for manuals and training materials.

### **D. Contractor's Management Plan**

The Contractor shall submit a detailed Management Plan [**CDRL 1-016**] including the overall organization, planning, schedule, and control of the Rehabilitation Program. The plan shall include sufficient details for SFMTA to comprehend the overall management and control process of the Rehabilitation Program. As a minimum the Contractor shall include the following details in the Management Plan:

- i. Approach and methodology to manage the Rehabilitation Program
- ii. An organization chart of the team planning to support the vehicle rehabilitation, including resume of the key staff members, and all staff conducting special activities such as Acceptance testing
- iii. Detailed description of project schedule activities including methodology to control schedule
- iv. Work task breakdown, including activities performed by the Prime and Subcontractors, and system integration in flowchart format
- v. A comprehensive Contractual Data Requirements List
- vi. Configuration Management Plan for all hardware, software, Submittals, drawings/schematics including description of change/modification control
- vii. Systems Engineering and Integration Plan describing in depth the approach to systems engineering and integration process and control

## SCOPE AND RESPONSIBILITIES

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- viii. Subcontractor Management Plan identifying the subcontractors, including their organization, role on the Program, QA/QC, configuration control, inspection, and testing requirements compliance
- ix. Labeling and Tagging Plan identifying methodology for assembly numbers, part numbers, serial numbers, and numbering system for wiring and harnesses
- x. Quality Assurance Program plan for all hardware and software
- xi. Inspection and Test Plan for all LRVs and all Subsystems
- xii. System Assurance Plan with target reliability, maintainability, availability goals and design means and methods to achieve those goals, and plans for remedial action if goals are not achieved
- xiii. Manufacturing Plan for LRVs and all Subsystems including disassembly and rehabilitation process
- xiv. A detailed matrix demonstrating compliance with all requirements in the Contractual documents including document references (such as test results/data etc.)

This is a partial list of requirements and the Contractor shall include additional items based on past experience. SFMTA or its designee shall have the liberty to request the Contractor to provide or include additional information as deemed necessary for the rehabilitation program.

### **E. SCHEDULE**

The Contractor shall maintain the Program Management Schedule per Section 1.04J of these Technical Provisions as part of the overall Management Plan. The schedule shall be in a time-scaled, bar-chart format indicating the detailed progress of the Program from the NTP through closeout. The Contractor shall update the schedule and submit it to SFMTA each month based on the progress. As a minimum the schedule shall include the following details:

- i. Completed activities and progress during previous two weeks in narrative format and highlighted on the schedule
- ii. Planned and actual progress for each unit and each LRV
- iii. Key milestones including but not limited to payments, Submittals, deliverables, Approvals, FAIs, static tests, Acceptance tests, delivery, and Acceptance
- iv. Planned activities for the next two months

All milestones, start-dates, completion dates shall be consistent with the Contract milestone dates.

## **SCOPE AND RESPONSIBILITIES**

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### **F. MEETINGS**

The Contractor shall schedule meetings and shall send invitations to SFMTA. The objectives of meetings shall vary but in general meetings shall be held to provide information, discuss an issue, request information, or update SFMTA of the progress. The duration of meetings may vary based on the type of agenda, however, the Contractor shall be responsible for documenting meeting minutes and submitting the minutes to the SFMTA for Approval. The meetings shall include design review meetings, progress update meetings, and other meetings.

#### **1. Design Review Meetings**

The Contractor shall schedule and organize design review meetings every four (4) weeks. The Contractor shall develop an agenda and distribute it to SFMTA with at least two (2) weeks of advance notice. The objective of such meetings shall be to update SFMTA on the design process and to facilitate the understanding of Contractor's design. The Contractor shall invite attendees to these meetings and shall record minutes for Approval by SFMTA. The Contractor shall make copies of all necessary documents such as reports, drawings/schematics, and test results as applicable to facilitate the meetings. In an event the issues are not resolved during this meeting the SFMTA shall assign a deadline for resolution, and the Contractor shall update SFMTA.

#### **2. Progress Update Meetings**

The Contractor shall schedule and organize progress update meetings every four (4) weeks. The Contractor shall develop an agenda and shall distribute it to SFMTA with at least two (2) weeks of advance notice. The objective of progress update meetings shall be to assess the milestones achieved, the progress made against planned schedule, and to identify schedule slippage and deficiencies. The Contractor shall prepare meeting minutes and shall submit it to SFMTA for review and approval.

#### **3. Other Meetings**

Throughout the duration of the Contract, it shall be necessary to hold special meetings to discuss specific issues. Either the SFMTA or the Contractor may initiate such meetings and shall distribute an agenda with one (1) week of advance notice to other party. The Contractor shall record minutes and shall distribute it to SFMTA for approval if deemed necessary by SFMTA.

### **G. SYSTEMS ENGINEERING AND INTEGRATION**

As part of this Contract, the Contractor shall develop a comprehensive and detailed System Engineering and Integration Plan (SEIP) [CDRL 1-017]. The plan shall include details of the Contractor's approach to the overall systems engineering and integration process. The SEIP shall include specifics of each subsystem being rehabilitated including

## SCOPE AND RESPONSIBILITIES

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description of tests verifying that the couplers, trucks, air supply units, doors and steps, articulation wires and harnesses interface seamlessly with the existing equipment.

The SEIP shall include specifics on at least the following:

- i. Description of general approach to systems engineering and integration to satisfy requirements of LRV Rehabilitation
- ii. Subsystem development and interfaces
- iii. Hardware and software integration
- iv. Subsystem installation and testing
- v. Influence of reliability, maintainability, safety, quality control/quality assurance, testing, and human ergonomics in design and maintenance

This is a minimal list and the Contractor shall be responsible for including all pertinent information to SFMTA. If deemed necessary, the SFMTA may request additional information. Throughout the document references shall be made as needed to each Subsystem installation drawings, schematics, installation plans, and other documents as necessary. Generic statement repeating the RFP language shall not be accepted.

### **H. Configuration Control**

The Contractor shall develop and maintain a Configuration Control Plan and a system and shall Submit both to SFMTA for review and approval [CDRL 1-018]. The Configuration Control System shall include all details necessary to identify, update, and track modifications, updates, changes to the LRV or its Subsystems. The Contractor shall keep the information and documentation within Configuration Control System up-to-date and shall furnish it to SFMTA upon request for review and Approval.

### **I. Weight Control Program**

The Contractor shall employ a Weight Control Program until the last vehicle is Accepted. As part of this program, the Contractor shall ensure and certify that the vehicle weight has not increased due to the Rehabilitation process. The Contractor shall assess the weight of each subsystem being rehabilitated and shall ensure that the weight does not exceed the original LRV weight. The Contractor shall include results of LRV weighting as part of the Car History Books prior to acceptance of the vehicles.

### **J. Inspections**

SFMTA shall conduct inspections on the vehicles and Subsystems. The intent of such inspections shall be to ensure that the Subsystem design conforms to the requirements identified within these documents. This shall include FAIs, routine in-shop inspections, and special inspections. The inspections shall be conducted at the Contractor's and/or Subcontractor's facilities and at SFMTA's facilities when the vehicles are shipped to SFMTA. The Contractor shall cooperate and support all inspections and shall provide all necessary information to the SFMTA. Inspections at Subcontractor's facilities shall be

## **SCOPE AND RESPONSIBILITIES**

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conducted with a ten (10) days advance notice, and inspections at SFMTA facilities shall be conducted without notice or with mutual arrangements with Contractor and SFMTA.

### **K. Testing**

The Contractor shall develop a comprehensive and detailed testing program as defined in Section TP10 of these Technical Provision.

### **L. Industry Standards, Codes, and Regulations**

The Contractor shall comply with all applicable requirements such as standards, codes, regulations, laws and requirements whether specified in these documents or not. The Contractor shall ensure that all such requirements are identified within appropriate documents and recorded. Whenever there is a conflict between two requirements, the Contractor shall bring it to SFMTA's immediate attention in writing and the most stringent requirement complying with these technical specifications shall prevail.

### **M. Quality Assurance/Quality Control (QA/QC)**

The Contractor shall develop and maintain a QA/QC Program consistent with Section TP09 throughout the duration of this Contract which shall be binding to all Subcontractors on the team.

### **N. Labels**

The Contractor shall apply labels to all rehabilitated equipment to indicate when it was rehabilitated. The labels shall be of the same type as the OEM labels currently installed on the equipment. The quantity and locations of labels shall be similar to the original labeling arrangement.

## **TP01.08 DELIVERY AND ACCEPTANCE CRITERIA**

### **A. Test Plans**

The Contractor shall submit to the Engineer a Master Test Plan, listing all tests and equipment adjustments required by these Technical Provisions and updated as required throughout the test program. The Test Plan shall cover all supplier and subcontractor tests to be completed at the supplier's or subcontractor's plant, all Contractor tests to be completed at its plant (in order to determine if the car meets the requirements of the Technical Provisions and is fully operational), prior to issuance by the Engineer of a "Certificate of Release for Shipment" and all testing to be conducted on SFMTA property prior to issuance by the Engineer of a "Certificate of Approval for Revenue Service." The plan shall include a plan for correction of defects and deficiencies. CDRLs are identified in Section TP10 of these Technical Provisions.

Should the Test Plan not be adequate and/or fail to meet the requirements of the Technical Provisions, the Engineer will require the submittal of additional plans, details, and schedules to ensure that the program is adequate to meet Technical Provisions requirements. The approval of the Engineer does not in any way relieve the Contractor of responsibility for the adequacy of the program within the scope of the Technical Provisions.



## SCOPE AND RESPONSIBILITIES

### B. Release for Shipment

A "Release for Shipment Certificate" for each LRV shall be submitted by the Contractor for SFMTA signature when all required supplier and Contractor "plant" tests, have been completed, reviewed, and accepted for the car and its equipment in accordance with the Technical Provisions, and when all documentation entered into the Car History Book has been reviewed and approved. A LRV shall not be delivered to SFMTA property without a "Release for Shipment Certificate" signed by SFMTA. The Contractor shall make any necessary repairs and perform other necessary corrective action so that all Open Items are corrected. **[CDRL 1-021]**

### C. Acceptance

An "Acceptance Certificate" for each LRV shall be submitted by the Contractor for SFMTA signature when all tests conducted on SFMTA property are complete in accordance with the Technical Provisions and the required reports have been received and approved, and all outstanding and/or revised CDRLs have been submitted for the LRV. **[CDRL 1-022]**

### TP01.09 CONTRACT DELIVERABLE REQUIREMENTS LIST

CDRL #	Title	Reference Paragraph
1-001	Master Program Schedule	1.04.A
1-002	Purchase Orders	1.04.A
1-010	Approval Drawings	1.05.A
1-011	Drawing Database and Updates	1.05.A
1-013	List Of Contract Drawings	1.05.C
1-014	Contract Drawings	1.05.C
1-015	Car History Books	1.06
1-016	Management Plan	1.07.D
1-017	Systems Engineering and Integration Plan	1.07.G
1-018	Configuration Management Plan	1.07.H
1-021	Release for Shipment Certificate	1.08.B
1-022	Acceptance Certificate	1.08.C

## SCOPE AND RESPONSIBILITIES

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End of Section