



DBI Report: 301 Mission Foundation Retrofit

San Francisco Board of Supervisors, GAO Committee
January 6, 2021

Responsibilities

- Review plans for code compliance
- Issue permits
- Investigate complaints
- Monitor habitability
- Inspect work
- Manage EDRT

Team

- Department of Building Inspection (DBI)
- Engineering Design Review Team (EDRT)
- Dan Brown and Associates (DBA)

DBI supports resuming construction

1. Retrofit will continue under the existing permits
2. Work includes installing production piles and conducting monitoring using revised procedures
 - a. Install additional piles to arrest settlement and prevent further tilt
3. DBI/EDRT/DBA to analyze settlement, tilt and pile installation logs between each pile installation
 - a. Previous three pilot installations experienced less than 0.1" of average settlement
 - b. Firm 0.25" settlement per pile "Stop work" limit in place

DBI Oversight



DBI and EDRT will review the HOA's proposal for safety and code compliance—the HOA will need a revised building permit to proceed with the revised plan.

DBI and EDRT are

- Currently reviewing Mr. Hamburger's proposal and documentation, including the "Projected Settlement and Tilt" and the "Supplemental Calculation package for the 18 Pile Design"
- Awaiting answers to outstanding questions in the comment log; DBI and the EDRT will need to evaluate project team responses
- Awaiting the detailed settlement analysis and are currently reviewing the HOA project team's FLAC3D analysis, calculations & potential scenarios:
 - Original piles – existing and connected to the building
 - Original plus 52 new piles per the approved plan
 - Original plus proposed number of piles under new permit

Next Steps

1. Continue ongoing review, analysis and feedback of building settlement, tilt, and construction impacts
2. Continue daily on-site monitoring during construction by DBI senior building inspector
3. Review HOA's revised plan for safety and code conformance; target completion: February 28, 2022

DBA Pilot Program Observations

36" Pilot Casings

- Observed #32 and #33
- Review of installation logs
- Recorded measurements between every drilling pass:
 - Soil plug thickness
 - Water level
 - Casing depth and drilling tool

24" Pilot Casings

- Observed #31
- Review of installation logs
- Reduced drill bit diameter
- Drilling rate, air pressure, water pressure, and logging of excavated material

All of the above applied to remaining pilot program piles and for proposed production piles going forward as observed and documented by Slate Geotechnical

Engineering Design Review Team

EDRT

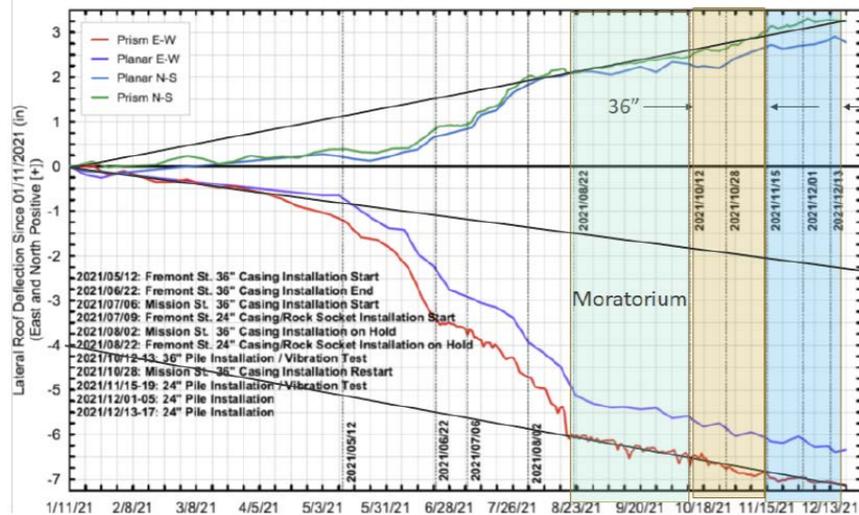
Prof. Greg Deierlein, PhD (chair)

Marko Schotanus, PhD, PE, SE

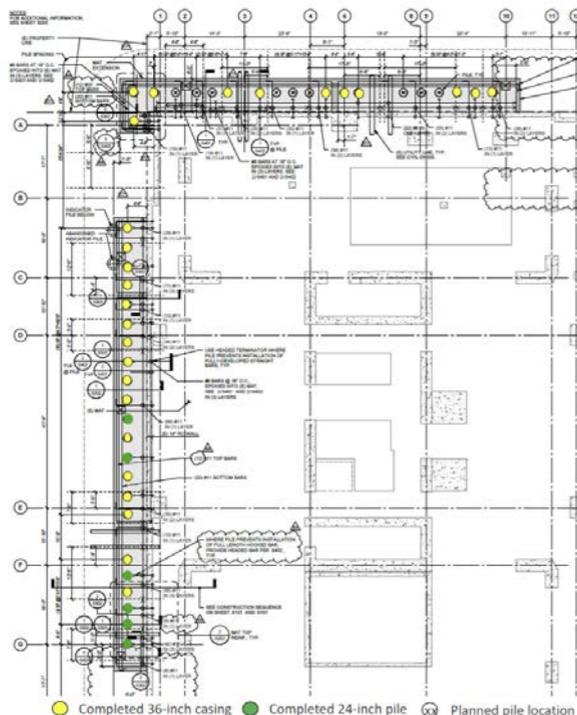
Craig Shields, PE, GE

Shahriar Vahdani, PhD, PE

Construction Settlement

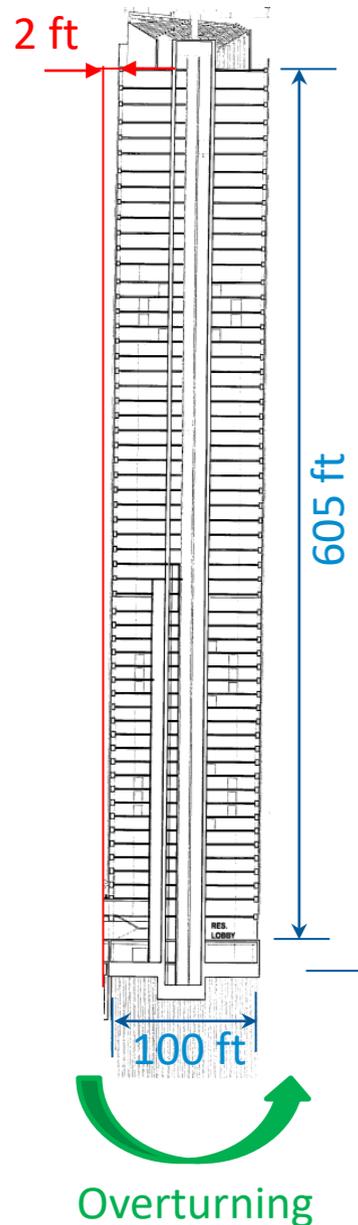


- Accelerated settlement that occurred during initial casing and pile installations (May-Aug 2021) is primarily attributed to disturbance/over-excavation of soil during construction
- Modified construction and monitoring procedures implemented in pilot casing and pile installations have been successful at reducing accelerated settlements
- Current settlement and building tilt rates, while significantly reduced from May-Aug. 2021, remain a concern until such time as they can be arrested by completion of the retrofit.



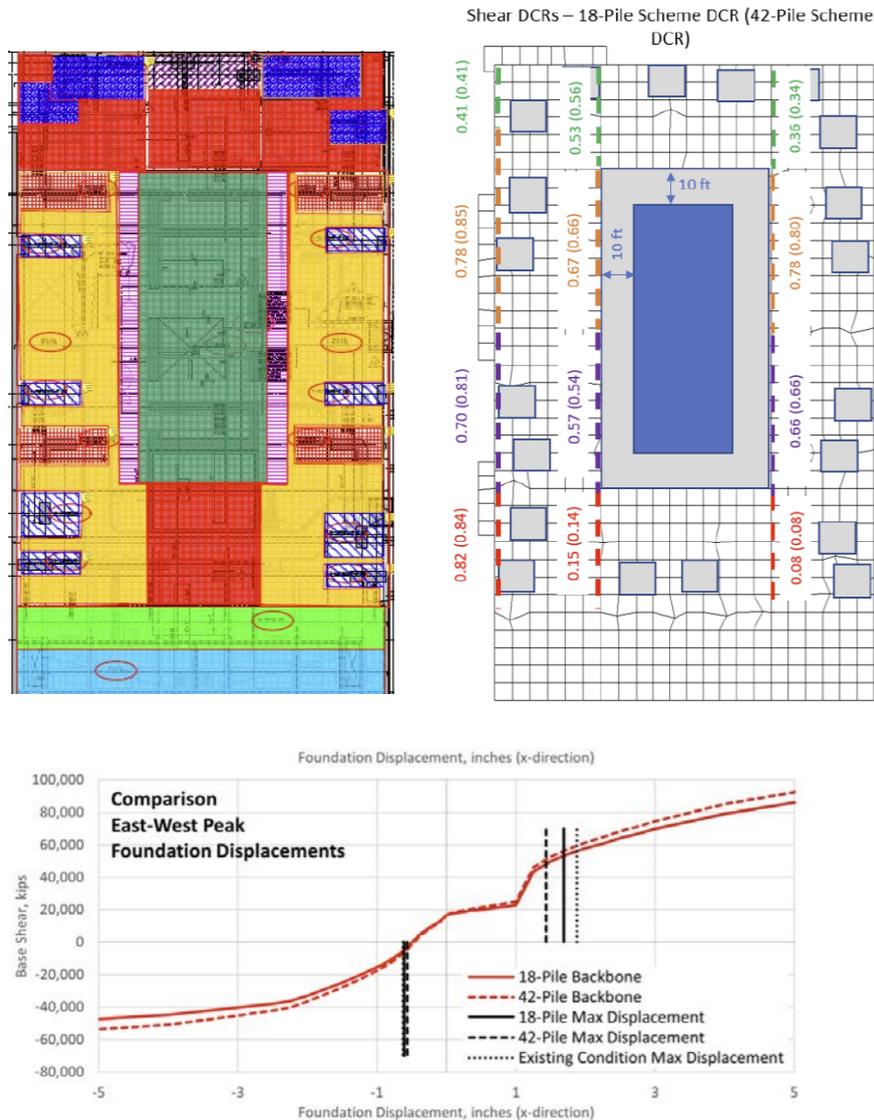
Effect of Settlement/Tilt on Building Safety

EDRT



- **Current Tilt: $1/300 = 0.3\%$ (24" to west)**
 - ACI 117 Maximum out-of-plumb 0.1% to 0.3%
 - PEER TBI Service Level Earthquake 0.5%
- **Current Gravity Overturning Moment (P- Δ):**
 - About 6% of Design Earthquake Overturning
- **Maximum Considered Earthquake (MCE):**
 - SGH analyses of building foundation and superstructure consider *combined effect of tilt and MCE earthquake* to establish that building meets minimum requirements per San Francisco Building Code and AB 083 for tall buildings
 - Current tilt (24") has negligible impact on earthquake safety
 - Impact on earthquake safety at larger (3x current) tilt is under review
- **Serviceability**
 - Being monitored, taking corrective actions as needed

Key Technical Aspects: Revised Scope Review



- **Reduced Number of Piles:** Under discussion/review
- **Pile Design Strengths:** Increased 25% to 1000 kips, based on results of indicator pile tests
- **Short and Long-Term Settlement and Tilt:** Review of detailed (FLAC 3D) settlement analyses to ensure that tilt to west & north is arrested and estimated tilt recovery
- **Earthquake Safety:** Building response/safety under gravity and earthquake loading (3D nonlinear analyses of existing and new piles, mat, and building superstructure)
- **Existing Mat & Mat Extension:** Safety of 10' thick concrete mat, with pile anchorage fuse