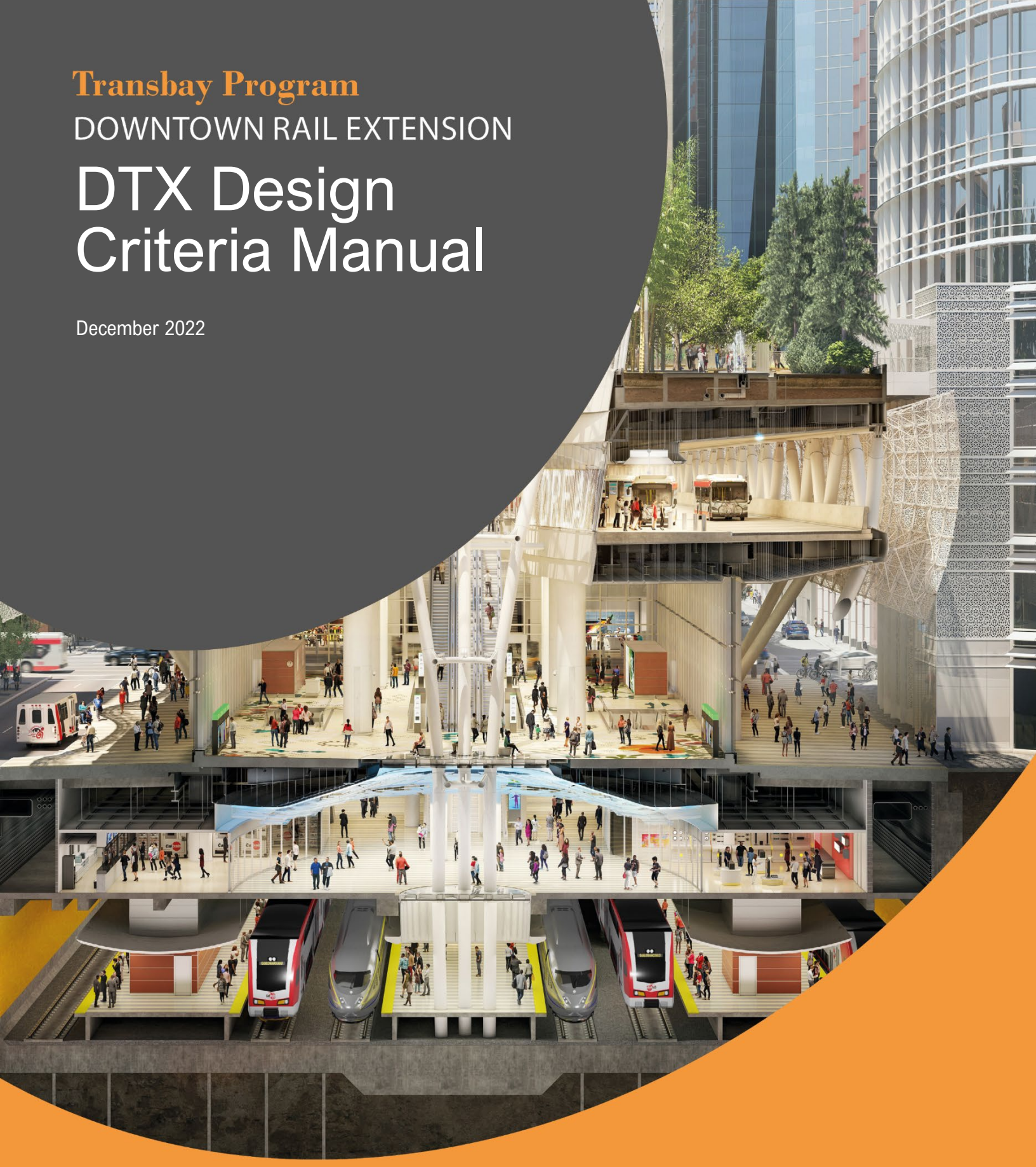
Transbay Program

DOWNTOWN RAIL EXTENSION

DTX Design Criteria Manual

December 2022



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CHAPTER 1 OVERVIEW OF THE DTX DESIGN CRITERIA

1.1 Purpose and Extent

The DTX Design Criteria establishes the engineering requirements for the Downtown Rail Extension (DTX) project of the Transbay Program in San Francisco, California.

The DTX design criteria apply to the design of all DTX facilities, unless otherwise directed by the specific facility owner. The criteria provide a uniform basis and framework for the DTX design that meet the requirements of the Transbay Joint Powers Authority (TJPA) and the rail operators—Caltrain and the California High-Speed Rail Authority.

1.2 DTX Project Description

The DTX will connect Caltrain's regional rail system and the statewide high-speed rail system to the Salesforce Transit Center in downtown San Francisco. The Salesforce Transit Center is owned and operated by the TJPA and is referred to throughout this manual as the Transit Center. The rail alignment will be constructed principally below grade to provide a critical link for Peninsula commuters and travelers on the state's future high-speed rail system.

The DTX alignment begins in the below-grade Transit Center rail station at First and Mission streets. At the west end of the station, the station's six tracks transition to two tracks through a cut-and-cover throat structure and continue in a mined tunnel southward under Second Street and westward under Townsend Street to a new underground station at Fourth and Townsend streets. West of the station, near Seventh and Townsend streets, the tracks ascend to grade via a u-shaped retained cut (referred to as the "u-wall"), and the alignment continues southward at-grade to Sixteenth Street, south of the existing Caltrain terminal station and 4th and King Railyards. A tunnel stub box extends side-by-side with the u-wall to allow for a connection to the future Pennsylvania Avenue Extension—a tunnel being developed by the San Francisco County Transportation Authority that will grade-separate the rail alignment from surface streets. Including revenue and non-revenue at-grade trackwork and stations, the total construction length of the DTX is approximately 2.2 miles. The main elements of the DTX project are as follows:

Transit Center train box extension. The train box extension will extend the existing below-grade structural box of the Transit Center eastward from the east side of Beale Street to the TJPA's property line to extend the platform lengths and provide ventilation and emergency exiting from the east end of the train box. A standalone structure, a pedestrian entrance and exit, will be located on Beale Street on the northern side of the train box extension. The train box extension, inclusive of the pedestrian entrance/exiting structure, will be constructed under TJPA property with an open-cut method.

Transit Center fit-out. The fit-out of the two-level below-grade rail station at the Transit Center will include facilities for rail operations, customer service, and ancillary support. The lower concourse, one level below the grand hall, will house ticketing, passenger waiting, and support spaces for Caltrain and the California High-Speed Rail Authority—the primary tenants—as well as leasable retail space. On the level below, six tracks and three center platforms will serve commuter and high-speed trains. Back-of-house support spaces will also be built on this level to support rail service.

Cut-and-cover structures. Cut-and-cover construction will be used along Second Street, Townsend Street, and in portions of the 4th and King Railyards for the following structures:

- Throat structure located at Second and Howard streets at the northern end of the DTX alignment where the two-track alignment widens to six tracks at the west end of the Transit Center
- Tunnel east of the Fourth and Townsend Street Station along Townsend Street
- Fourth and Townsend Street Station
- Tunnel west of the Fourth and Townsend Street Station along Townsend Street
- U-wall and tunnel stub box along Townsend Street west of Sixth Street to bring the tracks to grade and allow for a connection to the Pennsylvania Avenue Extension, a planned grade separation tunnel project being led by the San Francisco County Transportation Authority

Mined tunnel. Sequential excavation method mining is being considered for the tunnel along portions of Townsend Street and Second Street. The mined tunnel extends from the west side of Third and Townsend streets to Clementina and Second streets. The tunnel is primarily two tracks but expands to three tracks as it approaches the throat structure. The length of the mined portion of the tunnel is approximately 0.65 miles.

Fourth and Townsend Street Station. The Fourth and Townsend Street Station will serve Caltrain and high-speed rail passengers with destinations in the South of Market area or transferring to the San Francisco Municipal Railway (Muni) Central Subway. The street level station entrances and exits along Townsend Street will lead to two levels below grade: a concourse and a train platform level. The concourse level will accommodate passenger amenities such as restrooms, ticketing machines, maps, and schedule information. This level will also house mechanical and electrical rooms and staff areas. The platform level will have two tracks, an 875-foot center platform for Caltrain passengers, and two 800-foot side platforms for high-speed rail passengers. The underground station will be constructed using cut-and-cover techniques.

Ventilation and emergency egress. Ventilation and emergency egress structures will house equipment for the ventilation of the tunnel and include emergency egress to allow passengers to evacuate safely from the tunnels to grade in the event of an incident. Ventilation shafts will be located at either end of the Fourth and Townsend Street Station and the underground station at the Transit Center. Two standalone ventilation and emergency egress structures will be located along the tunnel alignment; these will be constructed on parcels next to the DTX tunnel outside of the street right–of-way, one at Third and Townsend streets and the other at Second and Harrison streets.

Trackwork. Trackwork includes the mainline tracks through the tunnel and stations as well as 0.4 miles of at-grade maintenance-of-way and turnback tracks within the existing Caltrain right-of-way.

Systems. Systems include rail systems such as traction power, overhead contact, train control, signaling, radio, and network systems; mechanical, electrical, plumbing, fire-life safety, and security systems for the tunnel, stations, and ventilation and emergency egress structures; and other support systems, such as closed-circuit television, fare collection, and passenger display information systems.

1.3 DTX Project Goals

As identified in the Transbay Program's environmental documents, the principal goals of the DTX project are to:

- Improve Caltrain service by providing direct access to downtown San Francisco

- Enhance connectivity between Caltrain and other major transit systems
- Provide direct access to downtown San Francisco for future high-speed rail service
- Reduce traffic congestion on U.S. Highway 101 and Interstate 280
- Improve regional air quality through reduced auto emissions
- Promote opportunities to develop land uses in conjunction with the proposed transportation facilities in a manner consistent with the City of San Francisco's land use goals and supportive of transit use

1.4 Operational Objectives

The DTX design must meet the following operational objectives:

- Provide safe and reliable movement of passengers and employees throughout the DTX system
- Minimize disruption to existing rail service
- Minimize project costs (i.e., capital, operating, and maintenance costs)
- Avoid adverse environmental impacts
- Minimize construction and operational impacts to neighboring communities
- Accommodate staged construction and provide capacity for system expansion, including future tunnel connections
- Modify the train box and advance construction of other rail-related infrastructure to respond to design specifications issued by the California High-Speed Rail Authority to accommodate future high-speed train service and Caltrain
- Locating sites for and constructing ventilation shafts/emergency tunnel exit structures and underground facilities to meet emergency response needs of system operations

1.5 Interface Coordination

The DTX designer must identify and coordinate interfaces with projects, plans, and infrastructure that may affect design, construction, or operation of the DTX; examples include:

- 4th and King Railyards – Prologis
- Future BART (Bay Area Rapid Transit)/Muni Pedestrian Connector – TJPA
- Central Subway – San Francisco Municipal Transportation Agency
- Future rail crossing to the East Bay – Link21
- Peninsula Corridor Electrification Project – Caltrain
- Pennsylvania Avenue Extension – San Francisco County Transportation Authority
- Private developments near the DTX alignment
- Public and private utilities, including San Francisco Public Utilities Commission's combined sewer system improvements

1.6 Design Criteria Organization

The design criteria are organized into chapters corresponding the principal disciplines of the DTX design. Where disciplines overlap, such as communications, fire-life safety, and security, the criteria are appropriately cross-referenced. Each chapter is summarized as follows:

Chapter 1: Overview of the DTX Design Criteria. Introduction and overview of the project's objectives and requirements and limited design criteria applicable to all or a number of project disciplines.

Chapter 2: Owner's Requirements. Specific owner's requirements relative to the functional and operational performance of the DTX.

Chapter 3: System Safety and Security. System safety management, reliability assurance, and safety certification requirements and specific design criteria for project security; project security features are also contained in other chapters.

Chapter 4: Environmental Requirements. General climatic setting and natural and existing built environment, which is used in conjunction with the specific design criteria presented in other chapters.

Chapter 5: Civil Design. General civil design, including survey control, roadways, and storm drainage, and requirements for maintenance and protection of traffic during project construction.

Chapter 6: Utilities. Design of new utilities, utility relocations, replacements, and abandonment.

Chapter 7: Guideway Geometrics. Track geometry (horizontal and vertical alignment) and required clearances and track spacing, including physical and operational clearances for rolling stock.

Chapter 8: Trackwork. Track, including track structure, track components, other track materials, and special trackwork.

Chapter 9: Geotechnical Requirements. Geotechnical exploration, testing, and analysis as well as seismic and ground motions performance criteria.

Chapter 10: Seismic Design. Seismic design of permanent structures, including mined tunnel final linings, cut-and-cover structures, retaining structures, slopes, bridges, buildings and surface facilities, and temporary structures, including the mined tunnel initial support and the cut-and-cover excavation support structure.

Chapter 11: Protection of Existing Infrastructure. Protection through temporary support or underpinning of existing facilities, including buildings, highway structures, utilities, and other infrastructure near to or affected by the DTX construction.

Chapter 12: Structures. Temporary and permanent structures including support of excavation, retaining walls, retained cut structures (boat sections), cut-and-cover structures, passenger stations, bridges, buildings, and miscellaneous structures; the design criteria include material properties and structure loading and durability requirements.

Chapter 13: Tunnels. Temporary and permanent structures including initial support, initial lining, and final lining for mined tunnels; the design criteria include material properties and structure loading requirements.

Chapter 14: Architecture and Vertical Conveyance. Architectural and site development design criteria for project facilities including the Fourth and Townsend Street and Transit Center stations. The design criteria for the stations include platform geometry, passenger circulation criteria, sizing of public and non-public spaces, employee equipment and office room layouts, materials and finishes, vertical conveyance, and site development requirements.

Chapter 15: Fire-Life Safety. Fire-life safety systems, including fire detection, alarm, and suppression systems; emergency lighting and tunnel ventilation systems, and fire fighters' air systems. The design criteria also include requirements for emergency egress and exit signage.

Chapter 16: Mechanical Systems. Mechanical design for DTX facilities, including station and ancillary facility ventilation and temperature control, elevators, and escalators, and plumbing and drainage systems.

Chapter 17: Electrical Systems. Electrical design for all DTX facilities, including requirements for materials and performance standards, electrical equipment and wiring, lighting, grounding, and power for tunnel operating systems, with the exception of traction electrification and high voltage services.

Chapter 18: Rail Systems. Supplemental criteria for train systems design including traction power electrification system, comprising an overhead contact system and power distribution, voice and train control communication systems, and signals and train control systems.

Chapter 19: Communications. Communications systems, including the communication backbone network requirements and project systems requirements for passenger amenities, security, and supervisory control and data acquisition.

Chapter 20: Stray Current and Corrosion Control. Corrosion control, including stray current, soil and water, and atmospheric corrosion control, including protective requirements and material selection.

1.7 DTX Projectwide Codes, Standards and Guidelines

The DTX design must comply with the requirements of government, operator, and industry codes, regulations, and standards. Specific codes, standards, and guidelines relevant to each discipline are listed in the chapter for that discipline. The lists of codes, standards, and guidelines in each chapter should not be considered exhaustive. See also Appendix B for a compiled listing.

The precedence for the application of codes and standards for each discipline is based on the specific requirements of that discipline. The code with highest precedence is listed first, as indicated in the following list:

1. Federal regulations
2. Statewide regulations
3. City and County of San Francisco codes (as applicable)
4. Operator criteria, requirements, and technical memoranda
5. Specific industry code or standard
6. California Building Code

In cases where there is no order of precedence, codes and standards are listed alphabetically, and the most stringent of the applicable code, standard, or guideline governs by default. In the case of a conflict between applicable codes and standards, the designer will propose a best practice for the particular purpose and confirm it with the TJPA.

1.7.1 Regulations

The current edition of the regulation at the time of notice to proceed for Final Design applies.
Any exceptions to the requirements of the regulations will require the approval of the governing authority.

1.7.2 Operator Criteria

- Caltrain Engineering Standards, which include:
  - Design Criteria
  - Standard Drawings
  - Standard Specifications
  - Standards for Design and Maintenance of Structures
  - Standards for Excavation Support Systems
  - CADD Manual
- CHSRA Design Criteria Manual and Technical Memoranda

1.7.3 Codes and Standards

The current edition of codes and standards at the time of notice to proceed for Final Design will be applicable. Any exceptions to the requirements of the codes and standards will require the approval of the governing authority.

1.8 Variances and Changes to Design Criteria

1.8.1 Variance Request

A proposed departure from these criteria must be documented on the TJPA's design criteria variance request form. Variance requests should be accompanied by calculations, sketches, examples of precedents, or other supporting documentation.

The TJPA's approval of a variance request does not grant a design variance from applicable regulatory codes and standards, which are outside the scope of this manual and must be obtained through the administrative procedures governed by the agency having jurisdiction.

1.8.2 Change Control

At the conclusion of DTX Preliminary Engineering and prior to the initiation of Final Design, the DTX Design Criteria Manual will become a controlled document, and a list of controlled document holders will be appended to the manual. See the TJPA's document control procedures for more on controlled documents.

Any proposed changes to the criteria resulting from a designer-initiated variance request, technological advances, amendments to operator design criteria, or any other reason will be reviewed by the project's Configuration Management Working Group, and if approved, recorded in a design criteria change history document, which will contain a unique identification number for each change, the date of implementation of the change, and a description of the change.

The Configuration Management Working Group and the TJPA will approve the distribution of updated design criteria, in accordance with its document control procedures.

1.8.3 Changes to Operator Criteria

The DTX design criteria incorporate design criteria for both Caltrain and high-speed rail, with the governing criteria for each element defined by the operators. For several disciplines, the DTX design criteria supplement or amend operator criteria, as approved by the operator through a variance process.

Each of these documents is a living document and will be subject to change over the lifetime of the DTX.

CHAPTER 2 OWNER'S REQUIREMENTS

This chapter defines the TJPA's requirements for the operation and performance of the Downtown Rail Extension (DTX) project. Conflicts between these operational and functional criteria and specific design criteria provided in subsequent chapters should be brought to the attention of the TJPA for resolution. See Chapter 1, section 1.8, Variances and Changes to Design Criteria.

The DTX design must not affect the operators' projected levels of service as described in their respective business plans.

2.1 Operations Control

Train movements throughout the DTX track network will be governed by a centralized traffic control system or similar type system.

The primary train control facility for the DTX will be located within Caltrain's Central Control Facility (CCF), which is not part of the DTX project. Any modifications to the CCF resulting from integrating the DTX must also be made to Caltrain's backup facility in San Jose.

A mimic train control facility will be located in the Transit Center. The mimic facility is intended primarily for use in emergencies.

2.2 Train Operations

DTX operation will support Caltrain commuter and California High-Speed Rail Authority (CHSRA) high-speed service on dedicated platforms in the Transit Center and the Fourth and Townsend Street Station.

Normal revenue operating hours for the DTX and Transit Center will be between 4:30 a.m. and 1:30 a.m., Monday through Friday, and between 6:00 a.m. and 1:30 a.m. on weekends. However, the design must assume a 24-hour-per-day operation.

The morning peak period for the DTX will be between 6:00 a.m. and 9:00 a.m., Monday through Friday. The evening peak period for the DTX will be between 4:00 p.m. and 7:00 p.m., Monday through Friday.

Track and signal layout must accommodate a minimum capacity of 2-minute 45-second headways for combined Caltrain and high-speed rail service on each track in each direction during the peak period.

Station dwell time is defined as the period from wheel stop to wheel start and is governed by the operators, Caltrain and CHSRA, at the Transit Center. See Table 2-1.

The Fourth and Townsend Street Station must accommodate both Caltrain commuter and high-speed rail service. The minimum dwell time at the Fourth and Townsend Street Station will be 2 minutes.

Table 2-1: Transit Center Dwell Times

Service	Scheduled Minimum
Caltrain	20
CHSRA	20

2.3 Ridership

Ridership levels are subject to change based on operator and stakeholder analysis. The designer must verify ridership levels with the TJPA before proceeding with design efforts that require ridership information.

2.4 Design Life

The minimum design life for the DTX infrastructure is shown in Table 2-2. The specified design life will be achieved through programmed maintenance.

Table 2-2: DTX Infrastructure Minimum Design Life

Infrastructure Element	Minimum Design Life (in years)
Underground structures	100
Above-grade facilities, including bridges, passenger station buildings, ventilation buildings, and other ancillary facilities	100
Traction power facilities including overhead contact system	50
Track systems (rail, fastening system, ties, ballast, subballast, and subgrade)	50
Train control system	25*
Communications systems	20*
Supervisory control and data acquisition system	25*
Civil design works - site improvements and storm drainage	50
Civil design works - roadways and pavement	25
Ventilation system	50
Mechanical, electrical, plumbing systems	50
Temporary facilities including shoofly (temporary tracks), temporary station facilities, traffic decking	5
Movement joints	25
Bearings	25
Architectural wall and floor finishes (accounting for regular cleaning, and minor repair every 10 years)	50
Elevators and escalators	25*

** Notwithstanding equipment upgrades, replacement, and enhancement consistent with manufacturers product service and support.*

2.5 Rolling Stock

The DTX design must accommodate the rolling stock of both Caltrain and CHSRA and allow for the most restrictive requirements of the possible trainsets as described in this section.

Use the rail loads described in Section 12.2.1, Loads and Forces, in the design of DTX structures.

2.5.1 Commuter Trains

Caltrain's electrified commuter trains will consist of bi-level electric multiple unit (EMU) trainsets. Caltrain has selected the KISS double-decker EMU manufactured by Stadler US Inc. for use on the DTX.

Trainsets comprise a maximum of ten cars, or measure 875 feet in total length, during peak service and will be configured to allow level boarding at the Transit Center and the Fourth and Townsend Street Station at their respective platform heights.

Caltrain's EMU design parameters are shown in Table 2-3. Because seating capacity and available standing area may vary depending on the configurations of the specific vehicles procured by Caltrain, measurements for weight, length, power consumption, etc., are presented as average values for a single EMU.

Table 2-3: Caltrain EMU Design Parameters

Length (ft)	Width (ft)	Height (ft)	Tare Weight AW0 (lbs)	Average Number of Seats	Available Standing Space (ft^2)	Auxiliary Power (kW)	Max. Output Power at the Wheels (kW)
90.26	10.61	15.88	165,000	110	350	65	6000

Use the values in Table 2-3 for the tare weight of the EMU (AW0). To calculate parameters AW1 through AW3, assume an average passenger weight of 195 pounds.

Include the weights of seated and standing passengers in calculations for the design of the following:

- Traction power systems: Use an average weight of train car with fully seated passenger load plus standing passengers at an intensity of 1 per 1.8 ft^2 of standing space—194 standing passengers, 304 total passengers (59,280 lbs) (AW3 = 224,280 lbs).
- Propulsion and braking characteristics (acceleration/deceleration and time to reach various speeds): Use the tare weight of the train car with a fully seated passenger load plus standing passengers at an intensity of 1 per 2.7 ft^2 of standing space—129 standing passengers, 239 total passengers (44,215 lbs) (AW2 = 209,215 lbs).
- National Fire Protection Association (NFPA) 130 station platform capacity and exiting requirements: Use an average weight of the train car with fully seated passenger load plus standing passengers at an intensity of 1 per 1.8 ft^2 of standing space—194 standing passengers, 304 total passengers (59,280lbs) (AW3 = 224,280lbs).

Use a maximum of 1.5 mph/s for the deceleration rate for the EMU. Do not assume that regenerative braking will be used.

2.5.2 High-speed Trains

The CHSRA has not yet selected the rolling stock it will use on the DTX. The design parameters presented in Table 2-4 are based on candidate wide-body high-speed trainsets. These criteria assume the following requirements for high-speed trains:

- Trainsets comprise eight-car consists of distributed-power units measuring 672 feet in length; however, CHSRA reserves the right to use double consists (sixteen cars) with a total length of approximately 1,345 feet. The station platform lengths will be limited to that of a single consist and operational means will be employed to allow passenger access to the other half of the double consist. Trackwork must be designed to avoid the fouling of crossovers by a double consist.
- Passenger capacity of high-speed trains is limited to the available number of seats. There will be no standees.

Table 2-4: High-speed Train Double-Consist Design Parameters

Length (ft)	Width (ft)	Height (ft)	Tare Weight (lbs)	Average Number of Seats	Auxiliary Power (kW)	Max. Output Power at the Wheels (kW)
1,345	11.08	15.68	1,920,000	900-1,000	3,200	22,000

Table 2-4 provides the tare weight of the rolling stock (AW0). Use the actual weight of the train car with fully seated passenger load (AW1) as the basis for the design of traction power load flow simulations to define propulsion and braking characteristics (acceleration/ deceleration and time to reach various speeds) and to define NFPA 130, (Standard for Fixed Guideway Transit and Passenger Rail Systems) station platform capacity and exiting requirements.

To calculate AW1, use an average passenger weight of 210 pounds (this assumes 15 pounds of luggage).

Use a maximum deceleration rate of 1.7 mph/s for full service at speeds of 100-0 mph and a minimum of 2.0 mph/s for emergency service on level tangent dry track. Do not assume that regenerative braking will be used. The acceleration rate for the high-speed train is 1.3 mph/s from 0 to 60 mph.

2.5.3 Maintenance Equipment and Work Trains

Rolling stock for normal maintenance and servicing in the underground portions of the DTX will be diesel-powered. Diesel-powered locomotives will be used for maintenance and servicing in the event of a power failure or when traction power must be turned off.

All maintenance equipment and emergency locomotives must be configured to correspond with the minimum clearances provided in CHAPTER 7 GUIDEWAY GEOMETRICS, for passenger service. The designer is responsible for writing operating procedures and obtaining approval for the procedures from the operators and accepted by the TJPA to ensure adequate ventilation and the safe operation of diesel-powered locomotives in the
DTX tunnel.

2.6 Reliable, Available, Maintainable and Safe

The design documents for DTX facilities must define minimum criteria for materials and construction processes. The materials and construction processes selected for the project must meet current standards of high-quality and be reliable, available, maintainable, and safe.

2.7 Operations during Construction

The DTX project includes the modification of the existing Caltrain mainline trackwork approach to the Fourth and King Street Station area. These tracks must be designed to Caltrain standards. Deviations from these criteria must be approved by the TJPA through a design variance request. See Chapter 1, section 1.8, Variances and Changes to Design Criteria.

As the construction of the new trackwork has the potential to adversely affect Caltrain and CHSRA operations (should CHSRA be operational at an interim station at the Fourth and King Street Station at the time of DTX construction), all efforts must be made to maintain an acceptable level of service for all rail operations through the DTX project area.

The staging and implementation of the mainline DTX construction in city streets must be coordinated with the San Francisco Department of Public Works and the San Francisco Municipal Transportation Agency, including its Municipal Railway light rail operations, to minimize disruption to surface traffic and communities.

2.7.1 Guideway Inspection and Maintenance

Ease of inspecting and maintaining the infrastructure must be a primary consideration in the design of the DTX.

The design of infrastructure requiring periodic inspection and maintenance must provide adequate access for both personnel to perform required inspection and maintenance, and for equipment removal and replacement.

Infrastructure must be provided with the initial protection necessary to maintain minimum standards of maintenance.

2.7.2 System Expansion

The design of the DTX must not preclude a future standard gauge rail connection to the East Bay, as mandated by California Senate Bill No. 916, October 2003.

Other potential accommodations for future system expansion must be incorporated into the DTX design, as directed by the TJPA.

CHAPTER 3 SYSTEM SAFETY AND SECURITY

SCOPE

System safety and security criteria will be established and confirmed through a systematic process of evaluating the safety and security needs of the Downtown Rail Extension (DTX) project, as defined in the Transbay Program's Safety and Security Management Plan (SSMP).

In accordance with the United States Department of Transportation, Federal Transit Administration's Circular 5800.1, the SSMP specifically identifies how Programwide issues of safety and security will be addressed and certified from initial project planning through the start of revenue service.

Safety and security criteria arising from the SSMP will be integrated into chapters of these criteria, including the following:

- Chapter 15: Fire-Life Safety
- Chapter 16: Mechanical Systems
- Chapter 17: Electrical Systems
- Chapter 18: Rail Systems
- Chapter 19: Communications

CODES, STANDARDS AND GUIDELINES

The following guidelines and references will guide the preparation of the SSMP and the development of the specific design criteria requirements:

- American Public Transportation Association (APTA), Manual for the Development of System Safety Program Plans for Commuter Railroads
- California Building Code
- California Occupational Safety and Health Administration regulations (Cal/OSHA)
- California Public Utilities Commission (CPUC) General Order (GO) 164-E, Rules and Regulations Governing State Safety Oversight of Rail Fixed Guideway Systems
- FTA Hazard Analysis Guidelines for Transit Projects
- FTA Transit Security Design Considerations
- National Fire Protection Association—NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems
- Transit Cooperative Research Program Report 86/National Cooperative Highway Research Program Report 525, Volume 12, "Making Transportation Tunnels Safe and Secure," Transportation Research Board
- U.S. Department of Transportation, Federal Railroad Administration Code of Federal Regulations (CFR)
- U.S. Department of Transportation, Federal Transit Administration (FTA), Circular 5800.1, Safety and Security Management Guidance for Major Capital Projects

Safety and security infrastructure must conform to relevant industry codes and standards.

3.1 Safety-Critical Systems

Systems for signaling, traction power, communications, fire-life safety, and security are deemed critical to the life-safety of DTX system users. Components of these safety-critical systems must be designed according to fail-safe and checked-redundancy principles and incorporate high-reliability parts, selective redundancy, and warning and protective devices, as required, to help achieve the specified requirements. Safety-critical systems must be capable of safe and correct operation under the extremes of the governing environmental conditions identified In CHAPTER 4, ENVIRONMENTAL REQUIREMENTS, and elsewhere.

3.1.1 Safety Principles

The principles governing the design of safety-critical system components are as follows:

Fail-Safe. The fail-safe principle applies to both hardware and software configurations and states that the occurrence of any failure of safety-critical hardware or software, or any combination thereof, must not result in a condition known to be unsafe.

Checked Redundancy. The checked-redundancy principle applies to both safety-critical hardware and software configurations and states that the probability of any failure or combination of failures must not result in a condition known to be unsafe or pose a greater risk than that associated with fail-safe design.

Alternate safety principles will be permitted, provided that they have been demonstrated through analysis, experience in service, and a rigorous safety certification process to provide a level of safety equal to that of the stated principles. Alternate principles must also be in accordance with recognized North American standards.

3.1.2 Special Criteria

The following special criteria govern the design of safety-critical systems:

- Safety-critical systems under normal conditions must prevent the use of inadvertent or incorrect actions or procedures by operating personnel.
- The design must not assume that procedures can be substituted to accomplish any safety functions provided by specific aspects, components, subsystems, or equipment.
- The design must assume that operating personnel will follow correct actions and procedures.
- If a hazard analysis demonstrates a conflict between human safety and equipment safety, the design must favor human safety.

3.2 Safety and Security Certification

The TJPA's safety and security certification process will be consistent with the requirements of CPUC General Orders and industry practice.

The goals of the safety certification process are to (a) ensure that all critical system elements have been monitored for safety and security from development through implementation, (b) verify that the DTX will be safe for full operation of Caltrain and the CHSRA before the commencement of revenue service, and (c) provide documentary evidence and verification showing achievement of the required level of safety, as defined in the SSMP.

The documentation will comprise a series of certificates attesting to conformance with safety and security requirements of the individual system elements, procedures, and training programs.

CHAPTER 4 ENVIRONMENTAL REQUIREMENTS

SCOPE

The Downtown Rail Extension (DTX) design must comply with federal, state, and local environmental regulations, guidelines, criteria, and approvals. The project is subject to National Environmental Policy Act and California Environmental Quality Act regulations.

The conditions indicated herein represent minimum design requirements. More stringent environmental criteria may be contained in other chapters or in related documents. In such cases, the more stringent criteria apply.

The Transbay Program's Final Supplemental Environmental Impact Statement/Environmental Impact Report (SEIS/EIR) identifies specific environmental impacts from the construction and operation of the DTX and offers mitigation measures in each case. Volume 2, Appendix D.2, contains all mitigation measures and other environmental commitments related to the design, construction, and operation of the DTX, which are incorporated by reference into these design criteria. The Final SEIS/EIR incorporates by reference, and for some environmental analyses, refines information in the Draft SEIS/EIR. In some cases, no changes to the potential impacts or mitigation measures were made in the Final SEIS/EIR. For these particular instances, the Draft SEIS/EIR is identified as the source document for further information on environmental conditions. The design and specification of DTX infrastructure must incorporate the appropriate mitigation measures and other environmental commitments specified for the DTX.

REFERENCES

Ackerly, David and Andrew Jones, Mark Stacey, and Bruce Riordan. 2018. California's Fourth Climate Change Assessment, San Francisco Bay Area Region Report. Publication number: CCCA4-SUM-2018-005

AECOM. Justification on Estimating the Critical Inundation Elevation at the DTX Station Entrances and Tunnel Portal. March 29, 2022. Prepared for the Transbay Joint Powers Authority.

AECOM. Port of San Francisco: Sea Level Rise Inundation Mapping Technical Memorandum. March 2016. Available at: http://docs.ppsmixeduse.com/ppp/DEIR_References/ 2016_0301_aecom_technicalmemo.pdf.

California Building Code

California Code of Regulations (CCR). Title 22, Social Security.

City and County of San Francisco. San Francisco Sea Level Rise Action Plan. March 2016. Available at: https://sfplanning.s3.amazonaws.com/default/files/plans-and-programs/planning-for-the-city/sea-levelrise/160309_SLRAP_Final_ED.pdf.

Federal Emergency Management Agency (FEMA). Flood Map Service Center. Available at: https://map1.msc.fema.gov/firm?id=0602980117A and https://map1.msc.fema.gov/firm?id=0602980119A. Accessed on January 26, 2022.

San Francisco Health Code. Article 22A, Analyzing Soils For Hazardous Waste. Available at: https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_health/0-0-0-4093

San Francisco Public Utilities Commission (SFPUC). 100-Year Storm Flood Risk Map. Available at: https://sfplanninggis.org/floodmap/. Accessed on January 12, 2022.

San Francisco Public Utilities Commission, 100-Year Storm Flood Risk Map Disclaimer. Available at: https://sfpuc.org/sites/default/files/learning/FloodMap-Disclaimer-2019.pdf. Accessed on January 12, 2022.

San Francisco Public Works Code. Article 4.1, Industrial Waste. Available at: https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_publicworks/0-0-0-441

U.S. Department of Transportation Federal Transit Administration and the Transbay Joint Powers Authority. November 20, 2018. Final Supplemental Environmental Impact Statement/Environmental Impact Report for the Transbay Transit Center Program.

U.S. Department of Transportation Federal Transit Administration and the Transbay Joint Powers Authority. December 2015. Draft Supplemental Environmental Impact Statement/Environmental Impact Report for the Transbay Transit Center Program.

4.1 Elevation

The project's critical flood inundation elevation discussed in section 4.5 is based on FEMA's Flood Insurance Rate Maps, SFPUC's 100-Year Storm Flood Risk map, and inundation maps prepared for the Port of San Francisco. The Port of San Francisco maps are included in the countywide Sea Level Rise Action Plan and are supporting evidence that sea level rise mitigation planning should be taken into consideration during DTX project development. A 2022 technical memorandum produced for the project, Justification on Estimating the Critical Inundation Elevation at the DTX Station Entrances and Tunnel Portal, details the methodology used to establish the critical flood inundation elevation. The ground surface elevation over the extent of the DTX alignment varies from a minimum of 6 feet to a maximum of 61 feet, approximately, based on NAVD 88 (North American Vertical Datum of 1988).

4.2 Temperature and Relative Humidity

Typical ambient temperatures San Francisco, California, range from approximately 40°F to 80°F, with recorded extremes of 28°F and 103°F. California's Fourth Climate Change Assessment, San Francisco Bay Area Region Report projects the average hottest day of year to increase by a minimum of 6.3°F along the coast.

Use the following temperature and humidity ranges for the at-grade portions of the DTX, unless otherwise specified in other chapters of this DTX Design Criteria Manual:

- Atmospheric ambient temperature ranges between 25°F and 109°F, accounting for projected warming resulting from climate change
- Relative humidity ranges between 5 percent and 95 percent

4.3 Wind Conditions

Use the following wind conditions:

- Maximum sustained 2-minute wind: 58 mph
- Maximum sustained 5-second wind: 59 mph
- Peak recorded gust: 74 mph
- Design gust: 85–100 mph pending building type/application, in conformance with section 1609A.3 of the California Building Code

4.4 Rainfall

Precipitation is seasonal. May through October is considered the dry season, and November through April is considered the rainy season. Use the following rainfall amounts and intensities:

- Normal annual rainfall: 15 to 22 inches
- Maximum rainfall in 24-hour period: 2 inches
- Maximum rainfall in 1-hour period: 1.5 inches
- Fewer than 10 days of thunderstorm days per year

4.5 Sea Level Rise and Floods

The project's critical flood inundation elevation of +13.32 feet (NAVD88) factors in sea-level rise over the 100-year life cycle of the project or 2 feet above the 100-year floodplain elevation, whichever is greater See *References*.

Critical facilities, such as the Transit Center and Fourth and Townsend Street station entrances, tunnel portal tunnel portal, and vent structures, must be designed so that the finish floor elevation or top-of-slab foundation are compliant with the criteria. Where the designer demonstrates that this requirement is not feasible, reasonable flood mitigations must be implemented. Deviations from these criteria must be approved by the TJPA through a design variance request. See Chapter 1, section 1.8, Variances and Changes to Design Criteria.

Where portions of the project are within the 100-year floodplain or may be affected by other portions of the project within the 100-year flood plain, the drainage facilities must be designed for the 100-year flood condition.

4.6 Snowfall, Ice Pellets and Icing

Snow and ice are rare; do not consider them in the design beyond typical building code considerations for San Francisco.

4.7 Fog

Heavy fog is common to San Francisco and must be considered in the design of above-grade sections of the alignment.

4.8 Soils

4.8.1 Geotechnical Data

The following reports must be referenced for soils, geologic, and seismic data for the DTX alignment. See CHAPTER 9, Geotechnical Requirements.

- Final Geotechnical Data Report, April 22, 2022
- Final Geotechnical Interpretive Report, May 6, 2022

4.8.2 Seismicity

The DTX will be located in an area of high seismic risk. The design must comply with applicable codes and standards governing the design of facilities capable of withstanding the forces and displacements associated with the maximum credible earthquake in the project area. Seismic design criteria are discussed in detail in CHAPTER 10SEISMIC DESIGN.

4.8.3 Groundwater

The DTX must conform to the requirements of the San Francisco Bay Regional Water Quality Control Board. A San Francisco Public Utilities Commission discharge permit may be applicable depending on the amount of discharge.

Dewatering discharges to the City of San Francisco sewer system will require a permit in accordance with Article 4.1 of the San Francisco Department of Public Works Code.

4.8.4 Resistivity

Criteria in abeyance.

4.8.5 Atmospheric Pollution and Contamination

Section 2.16 of the Final SEIS/EIR Volume 1 contains information pertaining to existing atmospheric pollutants and contaminants along the DTX alignment.

Requirements for mitigating air quality impacts of the DTX are specified in Appendix D.2 of the Final SEIS/EIR.

4.9 Hazards and Hazardous Materials

Section 3.10.3, of the Draft SEIS/EIR contains information pertaining to potential hazardous material impacts along the DTX alignment.

Sampling for hazardous materials must comply with Article 22A of the San Francisco Health Code and provide the data needed to achieve the overall objectives for the project. Samples must be analyzed for 22 CCR metals, with an emphasis on total and soluble lead concentrations for fill samples. Targeted analyses for organic compounds must be performed at source-specific boring locations, where contaminant releases are known or suspected to have occurred.

If hazardous wastes as defined in San Francisco Health Code Article 22A are identified during environmental site investigations, the designer must prepare a site mitigation plan in accordance with Article 22A. The site mitigation plan must include procedures to ensure that excavated material is managed in accordance with hazardous materials laws and regulations.

Groundwater samples must be analyzed for compounds listed in Article 4.1 of the San Francisco Public Works Code for Industrial Wastes.

A site-specific health and safety plan (HASP), prepared by a qualified environmental professional, is required for all construction work along the project alignment where hazardous materials may be encountered. Specific measures to be included in the HASP to protect construction workers and the general public will depend on the extent and magnitude of hazardous materials in soils and groundwater, but must include engineering controls, monitoring, and security measures as necessary.

4.10 Noise and Vibration

Section 2.12 of the Final SEIS/EIR Volume 1 contains information pertaining to noise and vibration impacts along the DTX alignment.

Requirements for mitigating noise and vibration during construction of the DTX are specified in Appendix D.2 of the Final SEIS/EIR.

CHAPTER 5 CIVIL DESIGN

SCOPE

This chapter establishes the requirements for the general civil design for the Downtown Rail Extension (DTX) project, including survey control; roads and streets; landscaping; fencing; drainage; and traffic control, including the maintenance and protection of traffic during construction. Civil design criteria are applicable to all project infrastructure, both above and below ground.

CODES, STANDARDS AND GUIDELINES

Civil design for the DTX must conform to the latest editions of the following standards, codes, specifications, and regulations, unless otherwise specified in these criteria:

- American Association of State Highway and Transportation Officials
  A Policy on Geometric Design of Highways and Streets (AASHTO Green Book)
- American Public Works Association (APWA) Standard Plans for Public Works Construction
- American Railway Engineering and Maintenance-of-Way Association (AREMA)
  Manual for Railway Engineering
- Americans with Disabilities Act (ADA) Standards for Accessible Design
- San Francisco Municipal Transportation Agency, Department of Parking
  and Traffic Regulations for Working in San Francisco Streets (Blue Book)
- California Building Code
- California Department of Transportation (Caltrans)
  - Caltrans Highway Design Manual
  - Caltrans Standard Plans and Standard Specifications
  - Caltrans Surveys Manual
  - California Manual of Uniform Traffic Control Devices
- Caltrain Engineering Standards
- California Public Utilities Commission (CPUC) General Orders (GO):
  - GO 36-E, In the Matter of the Establishment or Abolition of Agencies, Non-Agencies, Sidings, Spur Tracks and Other Station Facilities, and the Curtailment of Agency Service of Common Carriers
  - GO 72-B, Rules Governing the Construction and Maintenance of Crossings at Grade of Railroads with Public Streets, Roads and Highways in the State of California
  - GO 75-D, Regulations Governing Standards for Warning Devices for At-Grade Highway-Rail Crossings in the State of California
  - GO 88-B, Rules for Altering Public Highway-Rail Crossings
  - GO 135, Regulations Governing the Occupancy of Public Grade Crossings by Railroads

- Peninsula Corridor Joint Powers Board (Caltrain) Design Criteria
- San Francisco Department of Public Works (DPW) Order 187005 – Regulations for Excavating and Restoring Streets in San Francisco
- San Francisco Department of Public Works (DPW) Standard Specifications and Plans
- San Francisco Municipal Transportation Agency (SFMTA) Rail Rule Book
- San Francisco Public Utilities Commission Design Guidelines & Standards

Facilities within Caltrain property must conform to Caltrain standards, the AREMA Manual for Railway Engineering, and other codes and standards, as applicable.

Facilities outside Caltrain property must conform to the standards of the appropriate authority having jurisdiction, such as the City and County of San Francisco (City) and Caltrans.

5.1 Survey Control

5.1.1 Horizontal Datum and Control

The horizontal datum for the project is the North American Datum of 1983 (NAD 83), as defined by the National Geodetic Survey. Coordinates will be based on the California Coordinate System (CCS) of 1983, Zone 3, Epoch 1991.35. The physical reference network for the coordinates will be the California High-Precision Geodetic Network.

Project plans or other documents must indicate the basis of the coordinates used, including the CCS zone, physical reference network, and epoch used to establish the coordinates.

The primary horizontal control points shown in Table 5.1 must be used in conjunction with the project.

Table 5-1: Primary Horizontal Control Points (NAD 83)

Reference	Approximate Location	Northing (Lat.)	Easting (Long.)	Elevation (ft)
AB7679	Highway 101 near Candlestick Point	37 42 22.13446	122 23 36.88949	12.14
AB 7677	San Francisco Zoo	37 44 00.31877	122 29 49.01603	77.72
HT 0814	Yerba Buena Island	37 48 35.82913	122 21 58.10100	341.24

5.1.2 Vertical Datum and Control

The vertical datum for the project is the California state datum, i.e., the North American Vertical Datum of 1988 (NAVD 88), as defined by the National Geodetic Survey . Project plans or other documents must indicate the vertical datum. The primary vertical control points in Table 5.2 must be used in conjunction with the DTX design.

Table 5-2: Primary Vertical Control Points (NAVD 88)

Reference	Approximate Location	Northing (Lat.)	Easting (Long.)	Elevation (ft)
HT0759	Embarcadero SFFD Engine House #9	37 47 25	122 23 19	11.50
HT0758	SE Corner Intersection of Main & Harrison streets	37 47 17	122 23 25	31.74
HT0684	BART Transbay Tube ventilation building	37 47 43	122 23 34	4.79
HT0685	Embarcadero, between Market & Mission St.	37 47 39	122 23 33	10.17
HT0687	Southern Pacific Co. building, intersection of Market & Steuart streets	37 47 44	122 23 39	12.40
HT0787	Embarcadero, Bay Bridge Pier adjacent to Pier 26	37 47 17	122 23 18	14.79
HT0788	Embarcadero, Bay Bridge Pier adjacent to Pier 26	37 47 17	122 23 18	14.26

To convert elevations in National Geodetic Vertical Datum of 1929 (NGVD 29) or San Francisco Department of Public Works format to NAVD 88:

- Add 2.75 feet to original NGVD 29 elevations
- Add 11.35 feet to original San Francisco Department of Public Works elevations

5.2 Streets, Sidewalks Curbs, Ramps and Gutters

Existing streets, sidewalks, curbs, curb returns, driveway curb cuts, ADA ramps, and gutters disturbed by construction must be restored to their original function. The design of streets, sidewalks, curbs, curb returns, driveway curb cuts, ADA ramps, gutters, and striping must conform to DPW Standard Plans and Specifications. At a minimum, replacements must match the existing type and dimensions.

Improvements to sidewalks, curbs, ramps, and gutters must conform to the DPW Standard Plans and Specifications, APWA Standard Plans for Public Works Construction, and ADA Standards for Accessible Design .

5.2.1 Streets

The alignment, profile, cross slopes, and clearances of restored streets must match the preconstruction condition, unless otherwise agreed between the San Francisco Department of Public Works and the TJPA.

Geometric Design

The geometric design of streets must conform to the Caltrans Highway Design Manual and the AASHTO Green Book.

All major streets in the project area must be classified as urban minor arterials and designed for the greater of the currently posted operating speed or 35 mph.

Roadways and intersections must conform to AASHTO Green Book requirements to accommodate turning radii for standard design vehicles SU-30, WB-40, and BUS-40.

Design of at-grade crossings must conform to CPUC GO 36-E, 72-B, 75-D, 88-B, and 135.

Pavement Design

Pavement design must conform to DPW Standard Plans and Standard Specifications or the Caltrans Highway Design Manual, whichever governs, based on the traffic index and soil characteristics.

If the vertical clearance between road surface and top of utilities is limited, the design must include provisions for armoring the utility or backfilling with a lean concrete mix or controlled density fill material, or both. Chapter 6, UTILITIES, for applicable codes, standards, and requirements.

5.2.2 Grading

The existing terrain in the project area includes land with flat slopes to gradual slopes. Grading must be designed to maintain consistency with existing topographic conditions.

5.3 Landscaping and Streetscaping

The TJPA and San Francisco Department of Public Works will establish the requirements for landscaping and streetscaping as part of the reconstruction of City streets affected by the project. Pending an agreement with the Department of Public Works, the removal and replacement of trees in the public right-of-way must conform to San Francisco Department of Public Works regulations, and landscaping and streetscaping must be replaced in kind.

5.4 Permanent Fencing

Perimeter fencing to provide security and ensure the safety of the general public and employees of Caltrain, the California High-Speed Rail Authority (CHSRA), and the Transbay Joint Powers Authority (TJPA) will be required in specific locations, including:

- Caltrain station at Fourth 4th and King streets and 4th and King Railyards perimeter
- DTX portal and open cut-structures
- Ventilation structures
- Substations
- Other locations as agreed with the TJPA and San Francisco Department of Public Works

The TJPA and Caltrain will establish and agree on requirements for perimeter fencing for the Fourth and King Street Station and 4th and King Railyards and the DTX open-cut structures. Pending an agreement with Caltrain, perimeter fencing removed by the project must be replaced in kind.

Fence locations are subject to railroad clearance requirements, and must be coordinated with property lines, as necessary.

Fencing must be designed to

- withstand the wind speeds described in section 1609A.3, Basic Design Wind Speed, of the California Building Code.
- restrict thrown projectiles from impacting or hitting the sides and windshields of the trainsets.
- mitigate the effects of vandalism and graffiti during and after construction.

5.4.1 Low-Security Fencing

Low-security fencing must be 8-foot-high chain link fencing with 1-inch aluminum-coated steel fabric and support bars at the top and bottom of the fabric.

5.4.2 High-Security Fencing

Permanent steel high-security fencing must be made of one continuous sheet of diamond mesh that cannot unravel.

Gate locations must conform to the requirements established and agreed to by Caltrain, San Francisco Department of Public Works, and the San Francisco Fire Department (SFFD). Gates must include locking devices with separate keying for Caltrain and SFFD access.

5.5 Drainage

Base the design of drainage waterways, culverts, and structures on streets affected by DTX construction and within the affected Caltrain right-of-way on sound hydraulic principles to achieve an optimal combination of efficiency and economy. These criteria are relevant to the design of surface drainage only, including:

- At-grade guideway, consisting of the DTX mainline and associated tracks within Caltrain right-of-way
- Caltrain station at 4th and King streets and the 4th and King Railyards
- Storm drains and combined sewers in streets affected by construction

See CHAPTER 16, Mechanical Systems, for drainage design criteria for below-grade structures.

5.5.1 General Requirements

Drainage facilities requiring relocation or modification because of DTX construction must be replaced in kind or reconstructed to previous standards unless conditions of flow, loading, or operation are altered. If such conditions are altered, designs must conform to the design criteria and the standards of the facility owner. Do not include betterments in the design unless they are specifically agreed to between the drainage facility owner and the TJPA.

The design of drainage facilities in the Caltrain right-of-way including hydrologic and hydraulic design must conform to the Caltrain Design Criteria and CHSRA Design Criteria.

The design of drainage facilities in City right-of-way must conform to San Francisco Public Utilities Commission and San Francisco Department of Public Works requirements.

The design of drainage facilities owned by others that are relocated or modified because of DTX construction must conform to the design criteria and standards of the drainage facility owner. See CHAPTER 6, Utilities.

5.5.2 Hydrology

The hydrologic design of surface drainage facilities outside of the Caltrain right-of-way must conform to DPW Standard Specifications and Plans.

Design Storm

Drainage facilities in streets, parking lots, and other project areas outside of the Caltrain right–of-way must be designed for the runoff rate generated by the peak 5-minute duration precipitation during a 10-year storm.

Computation of Runoff

Compute the maximum expected discharge from drainage areas as follows:

- Drainage areas less than 0.5 square miles: Use the Rational Method and the values for the runoff coefficient (C) from the Caltrans Highway Design Manual. Coefficients prescribed by agencies with adjacent facilities that contribute flow must be used if these agencies have higher runoff coefficient criteria.
- Drainage areas greater than 0.5 square miles: Use standard, approved hydrologic design software packages such as the United States Army Corps of Engineers' (USACE) hydrologic engineering center (HEC) Hydrologic Modeling System or HEC-1.

The design must incorporate interception points at the tunnel portal location to collect flow during the design storm event.

See CHAPTER 4, Environmental Requirements, for the requirements related to sea level rise and floods.

Time of Concentration

The time of concentration for a drainage area must be equal to the time required for overland flow, plus the time of conduit or channel flow from the most remote point of the drainage area to the point under consideration. The time of concentration of overland flow must be limited to a maximum travel distance of 150 feet.

5.5.3 Hydraulics

The hydraulic design of surface drainage facilities outside of the Caltrain right-of-way must conform to San Francisco Department of Public Works design criteria.

Hydraulic Design

The San Francisco Department of Public Works intensity-duration-frequency curves may be used for the hydraulic design. Alternatively, standard software packages specifically designed for hydraulic design, such as the USACE computer programs HEC-2 or HEC-RAS or other software approved by the TJPA, may be used instead of tabular methods.

Hydraulic Design Considerations

The hydraulic design must meet the following requirements:

- The height of water surfaces resulting from design storm discharges at each structure and along the waterways must not encroach on the superstructure of bridge-type structures.
- Full flow-through culvert-type structures are acceptable, provided that the ratio of the headwater depth to the height of the culvert is 1.5 or less.
- Improvements at locations where an established FEMA floodway exists must comply with the requirements of the National Flood Insurance Program.
- Where drainage is picked up by means of a headwall and inlet or outlet conditions control, the pipe must be designed as a culvert.
- The capacity of existing drainage infrastructure downstream from drainage facilities constructed or modified as part of the DTX design must not be exceeded.

Velocity and Freeboard

The following requirements for normal depth and velocities must be satisfied.

- Storm drains must have a minimum velocity of 3 fps when flowing full (5-year storm event). Combined sewers must be designed for a minimum velocity of 2 fps flowing full.
- Minimum peak flow velocities in pipe culverts and concrete-lined channels must be 2 fps when flowing two-thirds full. Maximum flow velocities in pipes, culverts, and concrete-lined channels must be 10 fps when flowing two-thirds full.
- The hydraulic grade line (5-year storm event) of storm drains and combined sewers must be 4 feet below pavement or ground surface and never less than 2 feet.
- The maximum encroachment of water on roadway pavements must not exceed half of a through-traffic lane or 1 inch less than the depth of curb during a 10-year storm of 5-minute duration. Inlets must be provided to control the encroachment of water on the pavement.
- Where the anticipated outlet velocity for a waterway exceeds the maximum permissible velocity for the bed material of the receiving channel, an acceptable means of energy dissipation must be used to reduce the velocity to safe limits. Discharge onto a fill slope is not permitted unless provisions are made to protect the slope from scour. Trainsets are prohibited from operating if water is over 2 inches above top of rail.

Debris Control

Do not use static inlet head in determining the size of the opening of drainage structures receiving flow from open channels and areas that may contribute debris.

Do not provide trash racks or screens for culvert-inlet protection.

Where culvert headroom is required for debris, headwater and tailwater depths must not exceed 0.8 of the culvert diameter or height. Drawdown at the entrance to this depth must not be construed as meeting this requirement unless it can be shown that the drawdown allows free passage of all debris.

If the drainage structure is protected from debris by existing conditions upstream or if the structure is part of an enclosed storm drain system with all inlets grated or protected, static head may be considered in computing the capacity. The static head on the entrance to the culvert and the water-surface elevation in the system at peak conditions must not be higher than can safely be contained by headwalls, ditch banks, and tributary drainage systems.

5.5.4 Drainage Infrastructure

The design of drainage infrastructure, including inlets, manholes, pipelines, and underdrains in the Caltrain right-of-way must conform to Caltrain Design Criteria. Within City streets, the design of drainage infrastructure must conform to DPW Standard Plans and Standard Specifications.

Inlets and Manholes

Space clean-out boxes and manholes at a maximum of 400 feet apart for ease of maintenance.

Where abrupt changes in the direction or slope of a pipeline are required, place an inlet or a manhole at the point of change in conformance with Caltrain Design Criteria.

Pipelines

Use the following minimum pipeline diameters:

- Combined storm-sewer drainpipes: 12 inches
- Storm drains, including connections to inlets: 18 inches
- Culverts under roadways: 18 inches

Where headroom is restricted, equivalent pipe arches may be used instead of circular pipe.

Filter Material

Use the findings of the soils engineering investigation as the basis for the design of filter material gradations for fine and coarse aggregates and the inclusion of filter fabric.

5.6 Maintenance and Protection of Traffic

A Traffic Management Plan (TMP) must be developed in accordance with the applicable portions of the California Manual of Uniform Traffic Control Devices, California Temporary Traffic Control Handbook (CATTCH), Caltrans Highway Design Manual, and San Francisco Municipal Transportation Agency (SFMTA) regulations. The TMP will include a temporary traffic control plan to address traffic safety and control needs

through the work zones, including the details and locations of temporary infrastructure for detours and closures.

5.6.1 General Requirements

The TMP must include appropriate plans for the road closures and detours deemed necessary to support construction staging and to provide for safe operations during construction while minimizing and mitigating disruption of traffic and impacts to the community. Traffic within the limits of construction may be subject to speed reductions, altered traffic patterns, and reduced levels of service, as necessary.

Road closures and detours may be required during specific construction activities, such as the installation of girders over and next to active roadways and temporary street decking for cut-and-cover structures. Road closures will occur on weekday nights and weekends only.

Transit routes in the area may also be affected by construction. Detours may be provided for transit routes that run on the surface streets above the DTX alignment and may require the protection or decommissioning of the San Francisco Municipal Railway (Muni) overhead contact system (OCS). Procedures for OCS protection or decommissioning will be provided by others.

Routes for pedestrians and cyclists must have sufficient clearances and protections. Pedestrian detour routes must comply with ADA requirements.

5.6.2 Access

Access must be maintained within construction zones for:

- Emergency services and emergency vehicles
- Local businesses and residences

Temporary interruptions to local access to businesses and residences must be coordinated and agreed with the respective owners. A permit will also need to be acquired from San Francisco Department of Public Works if street space and sidewalks outside of the building property line or project limits are used for building or project construction, respectively. Special Traffic Permits (STPs) may be needed if a street, alley, or sidewalk needs to be closed during construction; STPs are issued by the SFMTA.

5.6.3 Temporary Infrastructure

Temporary infrastructure, including traffic control devices, traffic lanes, striping, and signage, will be used to implement detour routes and roadway closures. The design of temporary infrastructure must conform to the California Manual of Uniform Traffic Control Devices.

5.6.4 Temporary Traffic Lanes

The width of temporary traffic lanes must be no less than 10 feet and must provide enough transition before the lane begins and after the lane ends. The width of temporary turn lanes must also be no less than 10 feet. Parking lanes may be used as temporary traffic lanes. Temporary lane widths must be shown on the temporary traffic control plan.

5.6.5 Signage

City-owned signs to be removed and salvaged must be shown on the temporary traffic control plan

CHAPTER 6 UTILITIES

SCOPE

This chapter establishes the requirements for the design of underground and overhead utility work, including the support, maintenance, relocation, abandonment, restoration, and new construction of utilities beyond 5 feet from building lines affected by construction of the Downtown Rail Extension (DTX) project.

CODES STANDARDS AND GUIDELINES

All utility work must comply with the standards, criteria, and guidelines of the utility owner. If the utility owner has no published standards, use the latest edition of the following codes, standards, and guidelines:

- American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering
- American Society of Mechanical Engineers (ASME) Guide for Gas Transmission and Distribution Piping Systems of the ASME Gas Piping Standards Committee
- California Public Utilities Commission (CPUC) General Orders (GO):
  - GO 95, Rules for Overhead Electric Line Construction
- Caltrain Engineering Standards
- Code of Federal Regulations (CFR) Title 49, Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards
- Institute of Electrical and Electronics Engineers National Electric Safety Code
- National Fire Protection Association (NFPA)
  - NFPA 54, National Fuel Gas Code
  - NFPA 70, National Electric Code
- San Francisco Department of Public Works (DPW) Oder No: 187005, Regulations for Excavating and Restoring Streets in San Francisco
- San Francisco Department of Public Works (DPW) Standards Specifications and Plans
- San Francisco Municipal Transportation Agency, Department of Parking and Traffic Regulations for Working in San Francisco Streets (Blue Book)
- San Francisco Public Utilities Commission Asset Protection Standards
- San Francisco Public Utilities Commission Design Guidelines & Standards

The design of utilities within railroad right-of-way must conform to Caltrain standards, the AREMA Manual for Railway Engineering, and other codes and standards as applicable.

6.1 Design and Design Responsibility

Utility relocation design must indicate the utility infrastructure to be supported in place, temporarily or permanently relocated, or abandoned.

Coordinate utility work with public and private utility agencies to minimize conflicts and interruptions during construction. Private utilities may design new facilities or relocate existing facilities, or both.

It is anticipated that investor-owned utilities, including PG&E (Pacific Gas and Electric) and AT&T (American Telephone and Telegraph Company) , will perform their own relocation engineering. The designer is responsible for coordinating the designs of all investor-owned utility relocations and incorporating these designs into the contract documents. Additionally, private utilities may design their new infrastructure or relocate their infrastructure. All work by private utilities to relocate their facilities will be coordinated with the Transbay Joint Powers Authority (TJPA) to ensure that the work conforms with the project requirements and the project schedule and budget
is maintained.

Unless otherwise indicated, the designer must complete the design of the utility maintenance concepts and submit them to the respective utility owners for review and approval. Where these criteria indicate that the utility owner will complete the design of the utility maintenance concepts, the designer must review the concepts for compatibility and consistency with the DTX design.

6.2 Level of Service and Service Interruption

A level of service equivalent to the existing service for adjacent properties, residences, and businesses must be maintained throughout construction by supporting utilities in place, diverting utilities, or providing alternative temporary facilities.

Minimize interruption of existing utility services. Service must not be interrupted without the prior written consent of utility owners.

6.3 Relocation and Replacement

If temporarily relocated, existing utilities must be restored upon completion of work. If permanently relocated, the new utility must be operational before or coincident with the termination of the existing service.

Utilities requiring relocation or modification to allow for DTX construction must be replaced in kind or reconstructed to previous standards unless conditions of flow, loading, or operation are altered. If such conditions are altered, designs must conform to the design criteria and the standards of the utility owner. No betterments will be included unless specifically agreed to by the utility owner and the TJPA.

6.4 Corrosion Control

Corrosion control measures must be provided in accordance with CHAPTER 20, STRAY CURRENT AND CORROSION CONTROL.

6.5 Excavations

Excavations for utilities in City and County of San Francisco right-of-way must comply DPW Order No: 187005, San Francisco Municipal Transportation Agency's (SFMTA) Blue Book, and San Francisco Public Utilities Commission's (SFPUC) Asset Protection Standards.

6.6 Service Utilities

All design for the maintenance of service utilities, connections, and supporting infrastructure, including support-in-place, relocation and restoration, permanent relocation, and abandonment, must comply with the codes and standards indicated in Table 6.1. The minimum required clearance between pavement and top of utility is owner-specific based on the utility.

Table 6-1: Governing Codes & Standards for Service Utilities

Infrastructure	Applicable Code, Standard & Guideline	Maintenance Requirements
Sanitary, Storm and Combined Sewers	SFPUC Design Guidelines & Standards DPW Standard Specifications and Plans DPW Orders	CHAPTER 5, CIVIL DESIGN, for maintenance requirements
Domestic Water Lines and Hydrants	SFPUC Design Guidelines & Standards	Service will be maintained at all times; interruptions must be authorized by the SFPUC and the San Francisco Fire Department
Auxiliary Water Supply System (AWSS)	DPW Standard Specifications and Plans	Service will be maintained at all times; interruptions must be authorized by the SFPUC and the San Francisco Fire Department
Gas Lines	PG&E standards Codes and standards listed under Codes, Standards and Guidelines at the beginning of this chapter	
Steam Lines	Clearway Energy's requirements	
Electrical Power Facilities	PG&E standards SFPUC Design Guidelines & Standards SFMTA Blue Book	
Electrical Power Lines	PG&E standards	
Street Lighting	SFPUC Design Guidelines & Standards	
Traffic Signals	SFMTA Blue Book	See CHAPTER 5, Civil Design, for requirements for temporary traffic lights and supporting infrastructure for the routing and detouring of traffic during construction
Muni Overhead Contact System	SFMTA Blue Book CPUC General Order 95	
Telecommunications	Utility owner's requirements	

6.7 Basement Vaults of Adjacent Buildings

The basement vaults of buildings surrounding the project area that do not encroach on the DTX footprint must be protected in place. Vaults that conflict with the DTX construction will be subject to demolition and reconstruction prior to tunnel construction; demolition of unpermitted vaults/basements within the public right-of-way will be at the property owner's expense. The occupation of basement vaults by the TJPA's contractors for construction of the DTX must be coordinated with both property and utility owners and conform to CHAPTER 11, PROTECTION OF EXISTING INFRASTRUCTURE.

CHAPTER 7 GUIDEWAY GEOMETRICS

SCOPE

This chapter establishes the requirements for track geometry and clearances for the Downtown Rail Extension (DTX), including the track in the train platform levels of the Transit Center and Fourth and Townsend Street stations, and the requirements for design speeds and track geometry, the horizontal and vertical alignment of the DTX tracks, proposed clearances, and maintenance and construction tolerances for track and structures. These criteria are primarily governed by the Caltrain Design Criteria and incorporate approved design variances from Caltrain.

Situations that do not conform to these criteria must be evaluated to confirm that vehicle performance and operations, including the lateral movements of vehicle diaphragms, are acceptable.

CODES, STANDARDS AND GUIDELINES

Unless otherwise stated in this chapter, use the latest edition of the following codes, standards, and guidelines to develop the DTX guideway geometrics:

- American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering
- California High-Speed Rail Authority (CHSRA) Design Criteria Manual
- California Public Utilities Commission (CPUC) General Orders (GO):
  - GO 26-D, Regulations Governing Clearances on Railroads and Street Railroads with Reference to Side and Overhead Structures, Parallel Tracks, Crossings of Public Roads, Highways and Streets
  - GO 118-A, Regulations Governing the Construction, Reconstruction, and Maintenance of Walkways Adjacent to Railroad Trackage and the Control of Vegetation Adjacent Thereto
  - GO 164-E, Rules and Regulations Governing State Safety Oversight of Rail Fixed Guideway Systems
  - GO 176, Rules for Overhead 25 kV AC Railroad Electrification Systems for a High-Speed Rail System
- Caltrain Engineering Standards
- Code of Federal Regulations (CFR) Title 49, Part 213, Track Safety Standards
- National Fire Protection Association (NFPA), Code NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems

7.1 Design Speeds

Round down calculated design speeds to the nearest increment of 5 mph.

7.1.1 Maximum Authorized Speed

The maximum authorized speed for passenger trains within the limits of the project for at-grade and below-grade tracks varies between 20 mph and 40 mph. The maximum authorized speed for trains approaching the Fourth and King Street Station between Caltrain mileposts 0.2 and 0.7 currently varies between 20 mph and 40 mph.

7.1.2 Maximum Speeds on Curves

Calculate the maximum speeds on curves using the formula in Equation 7.1:

Equation 7.1: Maximum Speeds on Curves

$$V = ((E_a+E_u)/0.0007D_c)^{½}$$

Where:

V is the train speed in miles per hour.
Ea is the actual track superelevation in inches.
Eu is the maximum unbalanced superelevation in inches.
Dc is the degree of curvature in degrees, minutes, and seconds.

Maximum values for actual superelevation are shown in Table 7-3: Table . The maximum speed on curves must also be based on a maximum of 3 inches of unbalanced superelevation.

7.1.3 Maximum Speeds through Turnouts

The design speeds for passenger trains through turnouts are based on tangent point geometry and a maximum unbalanced superelevation of 3 inches. See the Caltrain Design Criteria, Chapter 2 – Track – Track, Part D – Special Trackwork for maximum operating speed through turnouts.

7.2 Track Geometry

The track geometry of the DTX must maximize system safety and maintain the riding comfort of passengers. These criteria typically contain two values for alignment design parameters: a desirable value (minimum or maximum) and an absolute value. The intent of the design is to meet the desirable values. In cases where the desirable values cannot be met, notify the TJPA but proceed with the design unless direction is received otherwise. Any deviations from these criteria must be approved by the TJPA through a design variance request. See Chapter 1, section 1.8, Variances and Changes to Design Criteria.

7.2.1 Horizontal Alignment

The horizontal alignment must be developed along track centerlines and consist of tangents and circular curves generally connected by spiral curves.

7.2.1.1. Minimum Tangent Length

Calculate the desirable minimum tangent length between ends of spiral curves using the formula in Equation 7.2:

Equation 7.2: Minimum Tangent Length

$$LT = 3V$$

Where:

L_T is the minimum tangent length, measured in feet.
V is the train speed in miles per hour.

The absolute minimum tangent length between the ends of spiral curves is 100 feet.

The desirable minimum length of track extension beyond the end of vehicle spot at stub-end tracks (platform or tail tracks) is 40 feet (distance between bumping post and bumper of trainset). The absolute minimum length of track extension beyond the end of vehicle spot at stub-end tracks is 20 feet.

Track Spacing

Track Spacing on Tangent Track. Values for the minimum distances between the centerlines of adjacent tracks are shown in Table 7-1.

Table 7-1: Minimum Tangent Track Spacing

Item	Desirable Value	Absolute Value
Mainline track to mainline track	15 ft 0 in.	14 ft 6 in.
Mainline to storage track	20 ft 6 in.	14 ft 6 in.
Storage track to storage track	15 ft 0 in.	14 ft 6 in.

The desirable value for spacing between storage tracks shown in Table 7-1 applies to tracks where no equipment will be serviced.

Track Spacing on Curves. On curves, to provide clearance between cars and locomotives equivalent to that obtained on adjacent tangent track, increase the distance between track centers

- a minimum of 1 inch for every 30 minutes of curvature where the amount of superelevation is the same on adjacent tracks or the superelevation of the inner track is greater than that of the outer track.
- a minimum of 1 inch for every 30 minutes of curvature, plus 3.5 inches for every inch of difference in elevation between the two tracks where the superelevation of the outer track is greater than that of the inner track.

Track Spacing on Superelevated Curves. If an outside track on a curve has greater superelevation than an inside track, adjust the track center spacing to account for the effects of the differential superelevation. For every inch of differential superelevation, increase the track center spacing by 3.5 inches.

7.2.2 Horizontal Curves

Horizontal curves must conform to the Caltrain Design Criteria, Chapter 2: Track, Part C – Track Geometry, subsection 3.3, Horizontal Curves unless otherwise stipulated in this chapter.

Minimum Length of Circular Curve

The absolute minimum length of circular curve is 100 feet.

Minimum Radius of Curvature

Calculate the desirable minimum radius of curvature using the formula in Equation 7.3:

Equation 7.3. Minimum Radius of Curvature

$$R = 4V^2/e$$
$$D_c = 2*\sin^{-1}(50/R)$$

Where:

R is the radius of curvature in feet.
V is the train speed in miles per hour.
e is the total superelevation required for equilibrium in inches.
D_c is the degree of curvature in degrees, minutes, and seconds.

The absolute minimum radius of curvature must be 650 feet for mainline tracks, and 500 feet for Caltrain-only tracks, including curved crossovers.

Circular curves for track geometry will be defined by radius and equivalent degree of curvature (D_c).

7.2.3 Spiral Curves

Use spiral, easement, or transition curves between horizontal tangents and circular curves and between compound curves. Spiral curves, and the application of spirals, must be clothoids and conform to Caltrain Design Criteria Chapter 2: Track, Part C – Track Geometry, Section 5.0: Spirals.

The desirable minimum spiral length is the largest of the values determined by the formulas shown in Table 7-2 . Round calculated lengths of spiral curves up to the nearest 5 feet.

Table 7-2 Minimum Length of Spiral Curve

Spiral Design Factor	Desirable	Minimum
Superelevation	Ls = 1.47EaV	Ls = 1.17EaV
Unbalance	Ls = 1.63EuV	Ls = 1.22EuV
Twist	Ls = 82Ea	Ls = 82Ea
Minimum Segment	Ls = 2.64V	Ls = 2.20V

Where:

L_s is the length of the spiral curve in feet.
E_a is the actual track superelevation in inches.
E_u is the unbalanced superelevation in inches.
V is the train speed in miles per hour.

Use design speeds with the maximum superelevation values shown in Table 7-2 to calculate spiral curve lengths. Round calculated lengths of spiral curves up to the nearest 5 feet.

Spiral curves must have a minimum length of 100 feet.

7.2.4 Reverse Curves

Avoid the use of reverse curves. Where reverse curves are unavoidable, the minimum tangent length between reverse curves must conform to the requirement in section 7.2.1, Horizontal Alignment. The use of reverse curves must be approved by the TJPA through a design variance request. See Chapter 1, section 1.8, Variances and Changes to Design Criteria.

7.2.5 Compound Curves

Compound circular curves may be used, provided they are connected by an adequate spiral, based on the difference between the required superelevation of the curves. The same speed must be used to determine the spiral lengths and superelevation for compound curves. The spiral lengths for compound curves must conform to the criteria in Section 7.2.3, Spiral Curves.

The minimum length of spiral between compound curves must be 62 feet.

7.2.6 Superelevation

Tracks must be superelevated to maximize the speed on curves, consistent with the performance of the trains. Superelevation is applied by raising the outside rail and must be varied uniformly along the length of the spiral curve.

Tracks must not have superelevation in the following conditions:

- Station platform tracks
- Yard, storage, tail, and maintenance tracks
- Tracks through turnouts and crossovers

Calculation of Superelevation

Superelevation is measured in inches and calculated to the nearest 0.25-inch using the following formulas:

Equation 7.4. Superelevation

$$e = 0.0007\ D_c V^2$$

Where:

e is the total or equilibrium superelevation in inches.
D_c is the degree of curvature in degrees, minutes, and seconds.
V is the maximum train design speed in miles per hour.

The total superelevation e is expressed as follows:

Equation 7.5. Total Superelevation

$$e = E_a + E_u$$

Where:

E_a is actual superelevation that is applied to the curve in inches.
E_u is unbalanced superelevation (amount of superelevation not applied to the curve) in inches.

Round up to the nearest 0.25-inch the actual superelevation calculated in Equation 7.4 and Equation 7.5. For any curve, a minimum of 0.5 inches of superelevation must be specified.

Maximum Superelevation

Maximum track superelevation must conform to the values shown in Table 7-3.

Table 7-3: Table Maximum Superelevation

Item	Desirable Value	Absolute Value
Actual superelevation (E_a)	4 in.	5 in.
Unbalanced superelevation (E_u)	3 in.	3 in.

Avoid negative unbalance.

Base spiral curve lengths on a maximum unbalanced superelevation of 3 inches.

Check superelevation against the range of operating speeds to ensure that the maximum allowable value for negative unbalance is not exceeded.

Minimum Superelevation

The actual superelevation must be a minimum of 0.5 inches.

The minimum unbalanced superelevation must be 1 inch, except in cases where the actual superelevation and the unbalanced superelevation total less than 2 inches. If the equilibrium superelevation is less than 2 inches, the actual superelevation and unbalanced superelevation must be approximately equal.

Specify the minimum superelevation for any mainline curve calculation that yields less than the minimum required superelevation.

7.2.7 Vertical Profile

The vertical alignment or profile must consist of vertical tangents connected by parabolic vertical curves having a constant rate of grade change. The vertical profile must be developed for the top of rail, which is the low or inside rail on a superelevated curve.

Grades are calculated as percentages, rounded to the nearest 0.01 percent.

Maximum Gradient

Maximum track gradient must conform to the values shown in Error! Reference source not found..

Table 7-4: Maximum Track Profile Gradient

Track Type and Condition	Desirable Value	Absolute Value
Mainline tracks	1.0%	3.0%
Station tracks	0.0%	1.0%
Storage tracks	0.00%	0.20%

The maximum design gradient, with curve compensation at 0.04 percent per degree of curve, if applicable, for grade up to maximum gradient (G_c) is as follows:

Equation 7.6. Maximum Design Gradient

$$G_c = G - 0.04D_{vc}$$

Where:

G_c is the maximum gradient as a percentage.
G is the gradient before as a percentage.
D_{vc} is the degree of vertical curvature in decimal degrees.

Vertical curves are not allowed where car coupling and uncoupling tasks would normally be performed. Car coupling and uncoupling must be performed on track with constant vertical gradient.

Minimum Gradient

A minimum gradient must be maintained in the DTX tunnel to promote drainage of the track bed. The desirable minimum grade in tunnels must be greater than or equal to 0.3 percent. The absolute minimum grade in tunnels will be 0.25 percent. If a grade of 0.25 percent is not practical, a drainage system in addition to the normal trackside facilities must be provided.

Minimum Length of Gradient

Calculate the desirable minimum length of vertical gradient between vertical curves using the following formula:

Equation 7.7. Minimum length of vertical gradient

$$L_g = 3V$$

Where:

L_g is the minimum length of gradient between vertical curves in feet.
V is the train speed in miles per hour.

The absolute minimum length of vertical gradient between vertical curves must be 100 feet.

7.2.8 Vertical Curvature

All changes in gradient must be connected by parabolic vertical curves with a constant rate of grade change per 100-foot station.

Minimum Length of Vertical Curve

The desirable minimum length of the vertical curve for both sags and summits is the largest of the values calculated by the following formulas:

Equation 7.8. Minimum Length of Vertical Curve

$$L_{vc} = 2.15DV^2/A$$
$$L_{vc} = 4.55V$$
$$L_{vc} = 400D$$

Where:

L_{vc} is the length of vertical curve in feet.
D is the absolute value of the difference in rates of grades expressed as a decimal.
V is the train speed in miles per hour.
A is the vertical acceleration, equal to 0.6 feet/sec/sec (ft/sec^2).

The absolute minimum length of a vertical curve for both sags and summits is 100 feet.

Minimum Radius of Vertical Curvature

Vertical curves must conform to the requirements for high-speed mainline tracks and shooflies, as recommended in the AREMA Manual for Railway Engineering and shown in the following formula:

Equation 7.9.Minimum Radius of Vertical Curvature

$$L_{vc} = (D*K*V^2) / A$$

Where:

L_{vc} is the length of vertical curve, in feet.
D is the absolute value of the difference in rates of grades expressed in decimal.
K is the conversion factor (2.15) to give L in feet.
V is the train speed in miles per hour.
A is the vertical acceleration, equal to 0.6 ft/sec^2.

The recommended vertical accelerations (A) for passenger trains must be 0.60 ft/sec2 (0.019 g). Under no circumstances will the length of vertical curve be less than 100 feet. Station platform and special trackwork will not be located inside of vertical curves.

7.2.9 Reverse Curves

Avoid reverse curves. Minimum tangent distances between reverse curves must conform to Chapter 7, subsection Minimum Tangent Length.

Compound Curves

Compound or unsymmetrical vertical curves will not be used on mainline tracks.

Combined Horizontal and Vertical Curvature

Avoid overlapping horizontal and vertical curves where feasible. The desirable minimum distance between end of spiral and beginning of vertical curve or end of vertical curve and beginning of spiral is 160 feet. The absolute minimum distance is 100 feet.

The use of overlap between vertical curves and horizontal spirals must be approved by the TJPA through a design variance request. See Chapter 1, section 1.8, Variances and Changes to Design Criteria. Where the overlap of horizontal and vertical curves cannot be avoided, the following conditions must be met.

- The minimum length of vertical curve, as calculated by all parameters, must be increased by a minimum of 50 percent.
- The speed on the horizontal curve must be adjusted as necessary to produce a desirable maximum unbalanced superelevation of 2 inches, and an absolute maximum unbalanced superelevation of 3 inches.

The design speed, horizontal alignment, and vertical profile must be adjusted so that the combined or equivalent curvature does not become excessive. The combination of vertical and spiral curvature must be checked to verify that the equivalent vertical curvature of the high rail is within allowable limits.

Combined horizontal and vertical curves are not allowed where car coupling and uncoupling tasks would normally be performed. Car coupling and uncoupling must be performed on track with a constant vertical gradient.

7.2.10 Turnouts

The alignment of turnout tracks must be along the turnout track curve and begin at the point of switch.

All turnouts and crossovers must be on a horizontal or vertical tangent alignment. Minimum lengths of tangent track at turnouts and crossovers must be within the limits specified in Table 7-5:. Avoid placing turnouts and crossovers on horizontal and vertical curves within the geometric constraints of the DTX. Placement of any turnout or crossover on a horizontal or vertical curve must be approved by the TJPA through a design variance request. See Chapter 1, section 1.8, Variances and Changes to Design Criteria.

Table 7-5: Minimum Tangent Length at Turnouts

Item	Desirable value	Absolute value
Between point of switch of turnout	50 ft	20 ft (tangent length will not be less than the length of stock rail projection)
Between point of switch and curve	100 ft	15 ft (tangent length will not be less than the length of stock rail projection)
Between point of switch and platform	100 ft	60 ft
Between point of switch and grade crossing	100 ft	50 ft
Between point of switch and last long tie of turnout	60 ft	15 ft (tangent length will not be less than the length of stock rail projection)

7.3 Clearances

Clearances between rail vehicles and fixed objects including structures and equipment must conform to the requirements in this section. The DTX design must conform to CPUC GO 26-D and 118-A and the clearance requirements established in this section.

The clearance envelope is based on requirements for commuter, high-speed, and maintenance and work trains. Maintenance and work trains proposed for use in the DTX tunnel must conform to the clearance requirements established for the passenger trains.

7.3.1 Definition of Clearance Envelope

The clearance envelope represents dedicated space for the rail vehicles into which no other part of the DTX system—structure or equipment—will encroach. The clearance envelope must be referenced from a working origin point located at the intersection of the centerline of track and the top of the running rail.

Caltrain and the California High-Speed Rail Authority have provided the data to establish the vehicle static envelope and the vehicle dynamic envelope for their respective rolling stock on tangent track. The California High-Speed Rail Authority vehicle dynamic envelope will be used as the DTX clearance envelope. The size and shape of DTX clearance envelope must be adjusted for non-tangent track and must consider vehicle roll and lateral shift, construction tolerances, and inswing/outswing resulting from track curvature and superelevation. The clearance envelope is derived from the worst-case composite vehicle dynamic envelope outlines provided by the operators.

Horizontal and vertical clearances on curved portions of the DTX must allow for changes in superelevation as identified in the following criteria:

- A minimum of 1 inch for every 30 minutes of curvature where the amount of superelevation is the same on adjacent tracks or the superelevation of the inner track is greater than that of the outer track
- A minimum of 1 inch for every 30 minutes of curvature, plus 3.5 inches for every inch of difference in elevation between the two tracks where the superelevation of the outer track is greater than that of the inner track

Vertical running clearances are governed by the overhead electrification requirements established by the Peninsula Corridor Joint Powers Board's Peninsula Corridor Electrification Project. Vertical clearances must be measured along track centerline.

The clearances calculated from the combination of VDE and horizontal and vertical running clearances must not be less than the minimum values specified in Section 7.3.4.

Vehicle Static Envelope

The Caltrain vehicle static envelope is based on the Caltrain electric multiple unit—the Stadler KISS double-decker. The high-speed train vehicle static envelope is based on a combination of in-service high-speed passenger equipment, Association of American Railroads Plate C, and International Union of Railways CG Gauge.

Vehicle Dynamic Envelope

"Vehicle dynamic envelope" is defined as the extreme car body displacement caused by rotational, lateral, or vertical car body movements, or any combination of rotational, lateral, and vertical car body movements, that occur when the vehicle is operating at speed on level, tangent track. Car body movements are due to allowable wheel and rail wear, truck suspension movements, spring action, and permitted tolerances in vehicle and track construction. The car body movements included in the vehicle dynamic envelope are defined in Table 7-6

Table 7-6: Vehicle Dynamic Envelope – Car Body Movements

Item	Magnitude*
Vehicle roll	
Track cross level deviation	1 in.
Gauge variation	1 in.
Alignment deviation	0.75 in.
Wheel flange wear	0.625 in.
Wheel-rail clearance	0.25 in.
Suspension movement	2 in.

** The values presented for magnitude in Table 7.6 are subject to change once the California High-Speed Rail Authority has selected its train manufacturer.*

At any single location, 50 percent of the calculated total car body movement must be applied.

The VDE for vehicles operating on level, tangent track is shown in Figure 7.1 The coordinates of the points indicated in Figure 7.1 are tabulated in Table 7-7.

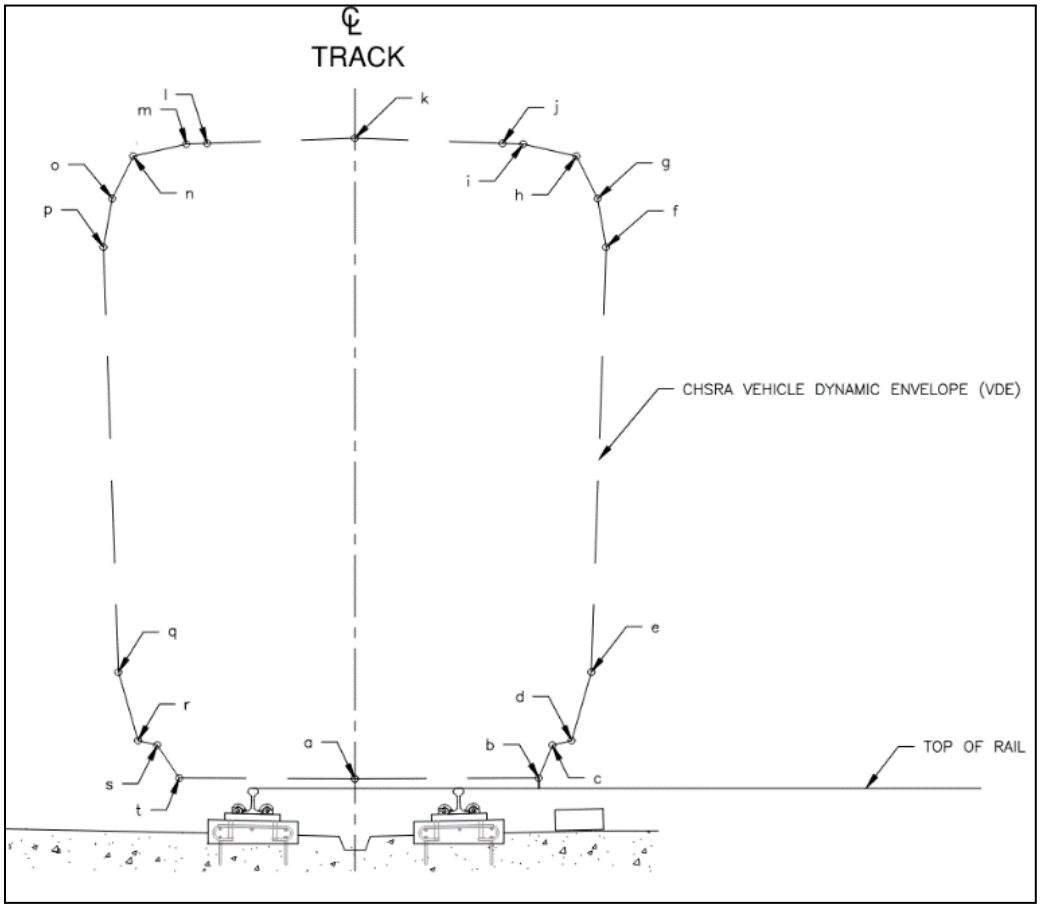

Figure 7.1: Vehicle Dynamic Envelope

Table 7-7: DTX Composite Vehicle Dynamic Envelope

Point Identification	Offset from Centerline of Track (ft)	Elevation above TOR (ft)
a	0.000	0.229
b, t	4.232	0.249
c. s	4.760	1.044
d, r	5.224	1.153
e, q	5.697	2.804
f, p	6.055	13.047
g, o	5.846	14.222
h, n	5.340	15.241
i, m	4.058	15.536
j, l	3.558	15.553
k	0.000	15.679

The effects of horizontal curvature resulting in mid-car inswing and end-of-car outswing of the composite vehicle must be considered. See subsection 7.3.4, Adjustments to Clearances for Horizontal Curvature and Superelevation, for calculating the amount of mid-car inswing and end-of-car outswing.

7.3.2 Horizontal Running Clearances

Horizontal running clearances provide for emergency egress and accommodate signals, switch machines, electrical disconnects, and other system equipment. Horizontal running clearances to fixed objects are measured from the centerline of track or from the composite VDE.

The minimum horizontal running clearance from the composite VDE to a fixed object must be 42 inches.

Locomotive and cab car mirrors, as well as other portions of the vehicle, must not protrude into emergency walkway space, as defined in CHAPTER 15FIRE-LIFE SAFETY, but they may project over the top of the walkway envelope.

7.3.3 Vertical Running Clearances

Vertical running clearances are defined by overhead contact system (OCS) requirements for minimum contact wire height. The criteria for OCS design requirements are provided in CHAPTER 18Rail Systems. See Table 18-3 in subsection 18.2.6, Electrical Clearances, for overhead, live-to-ground electrification clearance requirements.

7.3.4 Adjustments to Clearances for Horizontal Curvature and Superelevation

Horizontal running clearances to fixed objects must be increased to account for the effects of curvature and superelevation. Horizontal clearance must be measured perpendicular to the centerline of track.

Use the formula in Equation 7.10 to calculate the minimum increase to horizontal running clearances to account for curvature on the inside of curves:

Equation 7.10. Midpoint Offset Adjustment in Curves

$$MO = 1.5" D_c$$

Use the formula in Equation 7.11 to calculate the minimum increase to horizontal running clearances to account for curvature on outside of curves:

Equation 7.11 End of Car Offset Adjustment in Curves

$$EO = 1.125" D_c$$

Where:

MO is the mid car offset in inches.
EO is the end car offset in inches.
D_c is the degree of curve

Check the horizontal clearance at the beginning and end of a horizontal curve to verify that adequate clearance is maintained on the tangent portions where the vehicle will be partially on the curve. Instead of a calculation based on the actual vehicle geometry, the full compensated clearance on the curve will begin 25 feet before the curve, be maintained at the beginning of the curve, and tapered to the tangent clearance over a distance equal to the length of the rail car.

Clearances on the inside of horizontal curves must be increased to account for the effects of superelevation. Calculate the width of the clearance to account for the horizontal curvature before adding the effects of superelevation.

Use the formula in Equation 7.12 to calculate the angle of rotation from the applied superelevation:

Equation 7.12. Angle of Rotation Adjustment in Curves and Spirals

$$\Theta_{rotated} = \sin (E_a / 59.5)^{-1}$$

Where:

$\Theta_{rotated}$ is the angle of rotation in degrees.
E_a is the actual superelevation in inches.

The point of rotation for superelevation for both the static envelope and the dynamic envelope is the top inside corner of the inside rail of the curve, located at the track profile elevation and 28.25 inches offset from the track centerline.

7.3.5 Tolerances

The clearance envelope must accommodate appropriate tolerances for construction and maintenance of the track and structures.

Track Tolerances

Track construction tolerances are shown in Table 7-8. For track in cut-and-cover and mined tunnel sections, maintenance allowances must be provided to account for long-term deformations of the structure invert slab arising from groundwater and soil loading. Base the maintenance allowances on the outcome of the respective analysis of the structure types.

Table 7-8: Track Construction Tolerances

Item	Ballasted Track	Direct Fixation Track
Horizontal track construction tolerance	± 0.5 in.	± 0.25 in.
Vertical track construction tolerance	± 0.5 in.	± 0.25 in.

Structure Tolerances

Tolerances for structures that support or house the DTX trackwork are shown in Table 7-9. Structure openings must be increased by the amounts shown, where applicable, to allow for construction tolerances.

Table 7-9: Structure Tolerances

Structure	Horizontal	Vertical
Cut-and-cover tunnels (per cell)	2 in.	2 in.
Mined tunnel	2 in.	2 in.
Retaining walls	2 in.	N/A
Chorded construction (Based on 25-ft-long chords)	78/R (ft)	N/A
High-level platforms	+0/-0.5 in.	+/- 0.5 in.
Low-level platforms	+0/-0.5 in.	+/- 0.5 in.
Raised walkways	+0/-0.5 in.	+/- 0.5 in.
OCS poles	TBD	N/A
Signal poles	TBD	N/A
Signal bridges	TBD	TBD

7.3.6 Minimum Horizontal and Vertical Clearances

Minimum tangential horizontal clearances are shown in Table 7-10. The minimum horizontal clearance must be increased on non-tangent tracks and conform to the criteria in subsection 7.3.1, Definition of Clearance Envelope.

Table 7-10: Minimum Horizontal Clearance

Infrastructure Asset	Minimum Horizontal Clearance	
	Caltrain	CHSRA
Track centerline to face of tunnel partition wall	8 ft 7 in.*	8 ft 7 in.*
Track centerline to face of fixed equipment	8 ft 7 in.*	8 ft 7 in.*
Track centerline to face of station wall (condition where no walkway exists at the Transit Center)	7 ft 3 in.	7 ft 3 in
Track centerline to edge of level platform	5 ft 8 in.	6 ft 0 in.
At-grade track centerline to face of permanent structure	25 ft	25 ft
At-grade track centerline to fixed equipment	8 ft 7 in.	8 ft 7 in.

* *Conformance with CPUC GO 26-D must be verified once CHSRA rolling stock is identified.*

Minimum vertical clearances above top of rail are shown in Table 7-11Table 7-11. Minimum contact wire height is specified in CHAPTER 18, Rail Systems.

Table 7-11: Minimum Vertical Clearance

Item	Desirable value	Absolute value
Clearance from top of rail to overhead structure (structural beam, ventilation plenum, etc.) in DTX tunnel	24 ft 6 in.	21 ft 6 in.
At-grade clearance from top of rail to overhead structure soffit	27 ft	24 ft 6 in.

CHAPTER 8 TRACKWORK

SCOPE

This chapter establishes the requirements for design and construction of the Downtown Rail Extension (DTX) trackwork including track structure and track components, such as rail, ties, fasteners, ballast, subballast, special trackwork (turnouts and crossovers), track appurtenances, and at-grade crossings.

CODES, STANDARDS AND GUIDELINES

Trackwork design must conform to the latest edition of the following standards, codes, and guidelines in the following order of precedence, unless otherwise specified in these design criteria.

- American Railway Engineering and Maintenance of Way Association (AREMA) Manual for Railway Engineering
- California High-Speed Rail Authority (CHSRA) Design Criteria Manual
- California Public Utilities Commission (CPUC) applicable General Orders (GO):
  - GO 26-D, Regulations Governing Clearances on Railroads and Street Railroads with Reference to Side and Overhead Structures, Parallel Tracks, Crossing of Public Roads, Highways and Streets
  - GO 36-E, In the Matter of the Establishment or Abolition of Agencies, Non-Agencies, Sidings, Spur Tracks and Other Station Facilities, and the Curtailment of Agency Service of Common Carriers
  - GO 72-B, Rules Governing the Construction and Maintenance of Crossings at Grade of Railroads with Public Streets, Roads and Highways in the State of California
  - GO 75-D, Regulations Governing Standards for Warning Devices for At-Grade Highway-Rail Crossings in the State of California
  - GO 88-B, Rules for Altering Public Highway-Rail Crossings
  - GO 118-A, Regulations Governing the Construction, Reconstruction, and Maintenance of Walkways Adjacent to Railroad Trackage and the Control of Vegetation Adjacent Thereto
  - GO 135, Regulations Governing the Occupancy of Public Grade Crossings by Railroads
  - GO 164-E, Rules and Regulations Governing State Safety Oversight of Rail Fixed Guideway Systems
  - GO 176, Rules for Overhead 25 kV AC Railroad Electrification Systems for a High-Speed Rail System
- Caltrain Engineering Standards
- Code of Federal Regulations (CFR), Title 49, Part 213, Track Safety Standards

8.1 Track Requirements

8.1.1 Track Gauge

Track gauge will be 4 feet 8.5 inches, measured at 0.625 inch below the head of the rail on the gauge side on all tracks except on tight radius curves where gauge widening may be required.

8.1.2 Ballasted Track

Ballasted track will be composed of a well-compacted subgrade, subballast, ballast, ties (including elastic fastening system), running rail, and other track materials.

Ballasted track must be used for all at-grade mainline and non-revenue tracks including at-grade crossings.

8.1.3 Direct Fixation Track

Direct fixation track will be a low vibration track composed of concrete track bed, booted concrete block rail seats embedded in reinforced plinths or reinforced infill slabs, rail fastenings, special trackwork (turnouts and crossovers), guard rail, and running rail. Other track system types may be proposed as the supplier technologies evolve.

Direct fixation track must be used on all below-grade tracks, including station, tunnel, and open-cut/u-wall sections of the DTX alignment.

8.1.4 At-grade Crossing Track

The design of at-grade crossing track must conform to the Caltrain Design Criteria. See CHAPTER 8, subsection 8.2.7 and section 8.7.

8.2 Track Components

The design of track components and other track material must conform to the criteria described in subsection 8.2.1, Running Rail, through 8.2.9, Track Material Performance Requirements.

8.2.1 Running Rail

Running rail for permanent tracks and special trackwork must be new. Temporary tracks to support staged construction that will not be in service more than two years may be previously used but must be pretested for internal defects. Running rail will be 136 RE rail section and must conform to Caltrain Engineering Standards.

High-strength rail with a Brinell Hardness Number of 370 must be used in all special trackwork and new tracks.

Rail must be manufactured, and plant welded into continuously welded rail with a minimum section length of 1440 feet. Within project limits, 80-foot-long rail sections may be welded by electric flash butt method.

8.2.2 Concrete Ties

Concrete ties must be used for all permanent at-grade mainline running tracks, yard running tracks, and non-revenue running tracks. Concrete ties must conform to Caltrain Standards and the AREMA Manual for Railway Engineering.

Concrete ties must come complete with embedded rail shoulders, insulated rail seat pads, elastic rail clips, and rail clip insulators. Concrete ties must be between 8 feet 3 inches (minimum) and 8 feet 6 inches (maximum) in length and be installed at 24-inch spacing on center.

Concrete ties for at-grade crossings must be 10 feet in length, suitable for a moisture-prone environment, and installed to accommodate crossing panels and enhanced load distribution for additional vehicular traffic.

Concrete ties with a fastening system must be tested as a unit and meet all test recommendations in the AREMA Manual for Railway Engineering. Concrete tie fastening system must be galvanized or applied with a moisture and rust resistant paint. Concrete tie design must not be factored and conform to AREMA Manual for Railway Engineering, Chapter 30, Part 4.

8.2.3 Timber Ties

Timber ties with 16-inch Pandrol plates, e-clip, and screw spikes may be used for temporary trackwork, including special trackwork on ballasted track as part of the staged construction. Timber ties must measure 7 inches x 9 inches x 8 feet 6 inches in length and be installed at 19.5-inch spacing on center.

Timber ties may be used for temporary conditions only and must conform to the requirements of the AREMA Manual for Railway Engineering.

8.2.4 Transitions

Tracks must be designed to provide smooth transitions between different types track and changing track modulus. Reinforced concrete bridging slabs must be provided at transitions between direct fixation and ballasted track. Longer ties must be used in areas of ballasted track and conform to the Caltrain Standard Drawings to transition between standard tie zones and high modulus special trackwork or at-grade crossing zones. Direct fixation block spacing must be adjusted between areas of standard fasteners and high-resilience fasteners.

8.2.5 Ballast

Ballast design must conform to Caltrain Design Criteria Chapter 2 – Track, Section B – Track Structure, Subsection 5.0 – Ballast.

8.2.6 Subballast

Subballast design must conform to Caltrain Design Criteria Chapter 2 – Track, Section B – Track Structure, Subsection 3.0 – Subballast.

8.2.7 Geotextile Fabric

Geotextile fabrics must conform to the Caltrain Design Criteria.

8.2.8 Hot-Mix Asphalt Concrete Underlayment

Hot-mix asphalt concrete underlayment must conform to Caltrain Design Criteria Chapter 2 – Track, Part B – Track Structure, Section 4.0 – Hot-Mixed Asphalt Concrete Underlayment.

8.2.9 Track Material Performance Requirements

System Safety and Reliability

Track materials, including cut spikes, rail clips or pads, screw spikes, fastening systems, track bolts, nuts, spring washers, tie plates, rail anchors, insulated joints, standard joint bars, and compromise bars must be designed to resist corrosion in wet and dry climate to maximize system safety and reliability.

Noise and Vibration Mitigation

Resilient direct fixation fasteners must be used to minimize noise and vibration in accordance with commitments in the 2018 Final Supplemental Environmental Impact Statement/Environmental Impact Report . If direct fixation fasteners alone will not provide the required mitigation, then the design must incorporate other options for noise and vibration reduction, including the use of floating track slab in conjunction with elastomeric mats or discrete elastomeric bearings.

Fire Resistance

Track components including rail ties and direct fixation fasteners in tunnel sections must be non-combustible and have minimum smoke generation and toxicity characteristics.

8.3 Special Trackwork (Turnouts and Crossovers)

Special trackwork must conform to the Caltrain Engineering Standards. Where turnout sizes are not referenced within the Caltrain Engineering Standards, turnout sizes as specified in the AREMA Manual for Railway Engineering must be used. Where non-standard special trackwork is required, a design variance request must be submitted to Caltrain for approval.

The following turnouts and crossovers will be used:

- No. 8 and No. 9 lateral turnouts may be used in yard and non-revenue tracks where only Caltrain rolling stock will operate.
- No. 10, No. 14, and No. 20 lateral turnouts must be used in mainline tracks.
- No. 8 and No. 9 turnouts must have straight switch points and railbound manganese steel frogs. No. 10, No. 14, and No. 20 turnouts must have spring frogs.

8.4 Bonded Insulated Joints

Insulated joints must be prefabricated, factory assembled, epoxy-bonded, 36-inch, six-hole bar design assemblies conforming to the AREMA Manual for Railway Engineering and Caltrain Engineering Standards.

8.5 Track Appurtenances

8.5.1 Rail Lubrication

Train-activated rail lubricators must conform to the AREMA Manual for Railway Engineering (Volume 1 – Track, Chapter 5, Part 5, section 5.9 Wayside Lubrication of Rail on Curves and the manufacturer's recommendations. The design and location of lubricators must include an analysis to ensure the following locations are provided with sufficient lubrication to prevent excessive rail wear and provide noise abatement:

- Curved approach to the DTX between Seventh and Townsend streets
- Curved transition between Townsend and Second streets
- Throat structure approach to the Transit Center

Rail lubricators located below grade must be designed to support remote monitoring, electronic type functioning system, and provide containment of the lubricant in case of malfunction or rupture of a hydraulic hose or valve.

8.5.2 Bumping Posts

A bumping post must be provided at the end of each stub-end track. Hydraulic bumping posts must be installed before the end of the track and conform to manufacturer's recommendations and be compatible with Caltrain's new rail fleet and the California High-Speed Rail Authority's (CHSRA) fleet. Bumping posts must be designed to protect passengers and crew on the train, adjacent trains, and the platforms in the event of an over-run. The design must consider the track configuration, maximum likely speed, and rolling stock characteristics. See Chapter 7, subsection 7.2.1.1, Maximum Authorized Speed, for the minimum tangent lengths required between vehicle stop spot and face of trainset bumper.

8.6 Derailment Containment and Derails

8.6.1 Guard Rails

Guard rails are typically installed 10 inches from running rails to control movement of a derailed train and are typically positioned at raised portions of track or at approaches to tunnels or structural elements that require protection. Guard rails must be provided where a derailment could significantly damage adjacent structures, including the following locations: approaches to abutments and piers of overhead bridges, tunnel internal walls, and ends of high (CHSRA) passenger platforms. Guard rails must also be provided at curved track sections where derailments could pose an immediate risk to adjacent streets.

Guard rails will extend 25 feet beyond the length of track requiring guarding in both directions.

8.6.2 Restraining Rails

Restraining rails provide a narrow flangeway (1-5/8 inches) to avoid the derailment of a train navigating a curve with a radius of less than 500 feet. Restraining rails must be designed for curves of 500 feet or less.

8.6.3 Derails

The design and application derails must conform to the Caltrain Design Criteria, Chapter 2:–Track, Part D – Special Trackwork, 8.6.2 – Derails.

8.7 At-Grade Crossings

The design of temporary or permanent reconfigurations to existing at-grade crossings at Sixteenth Street and Mission Bay Drive must conform to CPUC GO 36-E, 72-B, 75-D, 88-B, and 135 as well as the latest edition of the Caltrain Design Criteria - Chapter 7, Grade Crossings, as modified by the requirements of the Caltrain Peninsula Electrification Program.

CHAPTER 9 GEOTECHNICAL REQUIREMENTS

SCOPE

This chapter establishes the following geotechnical requirements for the Downtown Rail Extension (DTX) project:

- Subsurface exploration and field and laboratory testing
- Reporting
- Ground improvement methods
- Excavation base stability
- Groundwater control
- Instrumentation and monitoring

This chapter does not provide specific design parameters. Because of the variability in ground conditions along the DTX alignment, the design parameters have been developed from site-specific subsurface investigations and laboratory testing programs. The geotechnical data and design parameters are presented in the geotechnical reports referenced herein. These geotechnical reports may only be relied on for design and bidding if they are indicated to be contractually reliable in the order of precedence set forth in the contract. Reference herein does not alone make these documents contractually reliable.

Additional provisions for geotechnical seismic design are identified in CHAPTER 13Tunnels, Tunnels, and other areas of these design criteria.

The subsections that follow specify the appropriate application of these codes, standards, guidelines, and references. Geotechnical investigations and analysis must be sufficient to obtain permits for the work.

CODES, STANDARDS AND GUIDELINES

Geotechnical design for the DTX must conform to the latest edition of the following standards, codes, and guidelines unless otherwise specified in these criteria.

- American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering
- ASTM International:
  - Annual Book of ASTM Standards, Section 4, Construction:
    - Volume 04.08: Soil and Rock (I): D420 – D5876/D5876M
    - Volume 04.09, Soil and Rock (II) D5878 - Latest
  - ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
  - ASTM D4623, Standard Test Method for Determination of In Situ Stress in Rock Mass by Overcoring Method—Three Component Borehole Deformation Gauge
  - ASTM D4729, Standard Test Method for In Situ Stress and Modulus of Deformation Using the Flat Jack Method
- Caltrain Engineering Standards

- Caltrans Highway Design Manual
- Caltrans Trenching and Shoring Manual
- Federal Highway Administration (FHWA), Geotechnical Technical Guidance Manual (GTGM)
- International Society of Rock Mechanics and Rock Engineering (ISRM)
- San Francisco Building Code (SFBC), which includes San Francisco Code Amendments (SF Amendments)
- San Francisco Department of Public Health requirements
- San Francisco Municipal Transportation Agency (SFMTA) Regulations for Working in San Francisco Streets (Blue Book)
- San Francisco Public Works Order No. 187005, Regulations for Excavating and Restoring Streets in San Francisco (or current superseding edition)
- State of California, Department of Water Resources, California Well Standards, Monitoring Well Standards (Bulletin 74-90)
- United States Army Corps of Engineers (USACE), Engineer Manual EM 1110-1-1804, Geotechnical Investigations
- United States Department of Defense Unified Facilities Criteria, UFC3-220-01N – Geotechnical Engineering Procedures for Foundation Design of Buildings and Structures
- United States Department of the Interior, Bureau of Reclamation (USBR):
  - USBR Earth Manual
  - USBR Ground Water Manual

REFERENCES

The following references may also be used in the geotechnical design of the DTX.

American Society of Civil Engineers (ASCE), R. Essex, Editor (2007). “Geotechnical Baseline Reports for Construction, Suggested Guidelines.” Technical Committee on Geotechnical Reports of the Underground Technology Research Council.

Bowles, J.E. (2001). “Foundation Analysis and Design,” 5th Edition. McGraw-Hill, New York.

Clough, G. W. and O'Rourke, T. D. (1990), “Construction induced movements of in situ walls.” Proceedings on Conf. on Design and Performance of Earth Retaining Structures. ASCE, Geotechnical Special Publication No. 25: 439-470.

Deere, D.U. and Deere, D.W. (1989), “Rock Quality Designation after Twenty Years.” U.S. Army Corps of Engineers. Report No. GL-89-1.

Federal Highway Administration Publication Number NHI-16-072, Geotechnical Site Characterization (Geotechnical Engineering Circular No.5).

Federal Highway Administration (FHWA), Publication Number NHI-97-021, Training Course in Geotechnical and Foundation Engineering: Subsurface Investigation.

Medley, E. W. (1994). "The Engineering Characterization of Melanges and Similar Block-in-Matrix Rocks (Bimrocks)." University of California, Berkeley, Ph.D. Dissertation.

NTNU-Anleggsdrift (SINTEF) (1998). Project Report 1F-98 "Hard Rock Tunnel Boring. The Boring Process."

Robertson and Cabal (2015) "Guide to Cone Penetration Testing for Geotechnical Engineering," 6th Edition, 2015.

Stokes and Varnes (1955). "Glossary of Selected Geologic Terms." Proc. Colorado Scientific Society, Vol. 16.

PROJECT-SPECIFIC REFERENCE DOCUMENTS

The following reports and memoranda have been prepared for the Transbay Program. The geotechnical reports may be updated if additional investigations are warranted when work on the Geotechnical Baseline Report begins.

Parsons Transportation Group & Wood Environmental & Infrastructure Solutions, Inc. June 3, 2021. Geotechnical Investigation Plan, Downtown Rail Extension Project, Transbay Program. Prepared for the Transbay Joint Powers Authority, San Francisco.

Parsons Transportation Group & Wood Environmental & Infrastructure Solutions, Inc. October 22, 2021. Geotechnical Characterization of the Major Soil Strata and Rock Units, Downtown Rail Extension Project, Transbay Program. Prepared for the Transbay Joint Powers Authority, San Francisco.

Parsons Transportation Group & Wood Environmental & Infrastructure Solutions, Inc. April 22, 2022. Geotechnical Data Report, Downtown Rail Extension Project, Transbay Program (four volumes). Prepared for the Transbay Joint Powers Authority, San Francisco.

Parsons Transportation Group & Wood Environment & Infrastructure Solutions, Inc. August 26, 2022. Geotechnical Interpretive Report, Part I, Mined Tunnel Segment, Downtown Rail Extension Project. Prepared for the Transbay Joint Powers Authority, San Francisco.

Parsons Transportation Group & Wood Environment & Infrastructure Solutions, Inc. May 6, 2022. Geotechnical Interpretive Report, Part II, Cut-and-Cover and Retained Cut Segments, Downtown Rail Extension Project, Transbay Program. Prepared for the Transbay Joint Powers Authority, San Francisco.

Parsons Transportation Group & Wood Environment & Infrastructure Solutions, Inc. May 6, 2022. Geotechnical Interpretive Report, Part III, Seismic Hazard, Downtown Rail Extension Project, Transbay Program (four volumes). Prepared for the Transbay Joint Powers Authority, San Francisco.

Slate Geotechnical Consultants Inc. March 10, 2022. Seismic Hazard Analysis – Phase 2 Transbay Program. Prepared for AECOM, San Francisco.

U.S. Department of Transportation Federal Transit Administration and the Transbay Joint Powers Authority. November 20, 2018. Final Supplemental Environmental Impact Statement/ Environmental Impact Report for the Transbay Transit Center Program.

9.1 Subsurface Exploration and Testing

The following subsurface explorations and tests must be carried out to identify the subsurface stratigraphy and its variations and groundwater conditions along the DTX alignment:

- Boreholes, using Standard Penetration Testing (SPT) and other sampling methods
- Cone Penetration Test
- In situ tests—field vane shear and pressure meter
- In situ downhole geophysical tests
- Installation of piezometers and pumping wells
- In situ permeability tests
- Packer tests

The number and locations of the exploratory borings and the location of all field testing must suit the anticipated conditions, consistent with project objectives and design requirements. A work plan for all exploration and testing work that details the locations, drilling depths, and methods to be used must be prepared and submitted to the Transbay Joint Powers Authority (TJPA) for review and approval before the exploration and testing work begins.

Field explorations and tests must conform to the most recent applicable standards included in the Annual Book of ASTM Standards, Section 4, Construction, Volumes 04.08 and 04.09, Soil and Rock; United States Army Corps of Engineers Engineer Manual EM 1110-1-1804, Geotechnical Investigations; and other applicable industry codes and standards. Work must also conform to the Blue Book, other applicable City and County of San Francisco codes, and San Francisco Department of Public Works orders.

Deviations from ASTM International, International Society of Rock Mechanics, United States Army Corps of Engineers, and other specified standards must be approved by the TJPA through a design variance request. See Chapter 1, section 1.8, Variances and Changes to Design Criteria. Field permeability tests must follow the methods outlined in the USBR Earth Manual and the USBR Ground Water Manual, unless otherwise approved by the TJPA.

All tested and untested soil and rock samples recovered from the geotechnical and geological field exploration program must be maintained in a readily accessible storage facility within 20 miles of the project site until the completion of construction. These samples must be made available for viewing by the TJPA or its designees within one business day of a request. The TJPA may elect to allow prospective bidders to view the samples. Upon completion of construction, the TJPA will have the option to take possession of the samples and will have at least 30 days to exercise that option. If the TJPA elects not to take possession of the samples, the designer will be responsible for sample disposal. Untested samples must not be disposed of or released to any other party at any time without the written authorization of the TJPA.

9.1.1 Soil Explorations

Explorations within soil units must include an appropriate selection from the following methods:

- Rotary wash boring:
    - Soil sampling should generally be once every 5 feet and at layer changes, with continuous sampling performed on an as-needed basis. Sampling frequency may be reduced generally to once every 10

feet and at layer changes outside of the tunnel horizon, defined as the tunnel section, and one diameter above and below the tunnel. Soil must be logged in accordance with the Caltrans Soil and Rock Logging Manual.

- For undisturbed and relatively undisturbed sampling of cohesive materials, where possible, use Dames & Moore piston sampler instead of Shelby tube sampling for soft to stiff cohesive materials.

- Seismic field testing. Seismic field testing is used to determine dynamic properties of the soil including downhole -S suspension logging (OYO Method or similar) and Seismic Cone Penetration Test such that each design or idealized soil column can be represented by a measured shear wave velocity profile. Shear wave and P-wave velocity information must be collected to adequate depth to establish a reference horizon.
- Vibracore (rotasonic) drilling
- Cone Penetration Tests

During rotary wash drilling, always keep the drilling fluid in boreholes above the groundwater level and avoid rapid fluctuations in the level of drilling fluids. Thoroughly clean the boreholes prior to taking samples. Collect the drill cuttings in drums and dispose of them in accordance with applicable regulations.

9.1.2 Rock Explorations

If bedrock is encountered in boreholes within the planned depth of drilling, continuous rock coring must conform to the following procedures:

- Rock coring will use a triple tube HQ coring system or a larger diameter triple tube coring system. The HQ system produces cores measuring 2.4 inches in diameter. The advantage of the triple tube system is that a split liner is used to contain the core, which results in less disturbance to the core.
- Where weak rock zones are encountered, alternative soil sampling techniques must be used instead of coring to recover samples that would be relatively undisturbed and suitable for testing. These techniques include the use of samplers such as the Pitcher, Dames & Moore, or Modified California samplers. The potential difficulty with these samplers is that they can be easily damaged by hard, gravel-size particles that are often mixed with the softer clay-like matrix of the weathered shale. These difficulties must be considered in the planning of the exploration program.

As part of the above-described explorations, an appropriate number of the following tests should be performed to adequately characterize the bedrock:

- In hole permeability/packer tests
- Rock deformability (dilatometer and/or pressure-meter tests)
- Seismic tests: downhole P-S log by OYO method or equivalent to collect shear wave and p-wave velocities in the rock
- Acoustic televiewer and/or optical logging
- Horizontal in situ stress evaluations such as double packer test method (ISRM 40, 2003), over coring (ASTM D4623), and/or flat jack testing (ASTM D4729)

9.1.3 Core Logging in Soil and Rock

A California-licensed geotechnical engineer or certified engineering geologist, as approved by the TJPA, must continuously monitor the drilling and coring procedures, visually classify the rock core, or soil samples obtained, and prepare a field borehole log. There must be at least one geotechnical engineer or engineering geologist for each drilling rig. In the case of rock core, logs must include a characterization of joints and texture and determination of rock-quality designation. Soil logs must include percent recovery for each sample in addition to the Unified Soil Classification System as adopted by ASTM D2487, soil description, and other descriptive terms required by the relevant ASTM standards. An experienced certified engineering geologist must also be on site to verify the classification of recovered rock and soil materials and aid on-site engineers, geologists, or other personnel.

At the end of each day, rock cores must be placed in plastic core bags or double-wrapped in plastic wrap, placed in wooden core boxes labeled with the horizontal and vertical locations where the cores were taken and the date, and transported to a storage facility. An adequate number of core boxes must be maintained on site at all times during field exploration activities. The cores must be photographed, taking at least one photo for each core box and closeups of special features such as shear zones or other features of special interest. The photo must clearly show the core box label. An experienced engineering geologist must study the core and edit the borehole log based on the geologist's observations. Core boxes must be maintained in the San Francisco Bay Area throughout the design process and through bidding, with cores that have been removed for testing duly indicated in the appropriate locations in each box.

9.1.4 Cone Penetration Tests

Cone Penetration Tests must conform to the applicable ASTM standards, and the equipment must be capable of simultaneously measuring tip resistance, side sleeve, and pore pressures.

The testing equipment must be capable of performing downhole seismic surveys when required.

Pore pressure dissipation tests must be performed at selected depths to evaluate the consolidation characteristics of the soils and/or verify the hydrostatic water pressures.

Interpretation of the test results must follow the procedures described in the Guide to Cone Penetration Testing for Geotechnical Engineering (Robertson and Cabal 2015).

Cone Penetration Tests must not be terminated in loose or medium dense cohesionless material or soft to stiff cohesive material. The geotechnical investigation work plan must include the test's target depth and criteria for termination including practical refusal.

9.1.5 Field Vane Shear Tests

Field vane shear tests must conform to the most recent applicable ASTM standards in soft soils to measure their in situ undrained shear strength. Test should usually be performed at small intervals ranging in depth from 1 foot to 3 feet. Near the top of the layer, tests must be performed at 1-foot intervals to determine the variation in strength with depth. At the bottom of the layer, tests must be performed at intervals of 1 foot to 2 feet.

9.1.6 Groundwater Monitoring

Recurrent monitoring must be performed in the project area, as defined and approved by the TJPA, to characterize seasonal fluctuations in groundwater level. Where possible, the groundwater levels must be monitored in each borehole. If accurate groundwater levels cannot be measured at the time of drilling because the use of drilling mud obscures groundwater levels, it may be appropriate to drill a secondary shallow hole next to the (primary) borehole where sampling is being performed and the groundwater levels in the secondary borehole may be monitored during the course of the primary borehole drilling. Upon completion of drilling and sampling of the primary borehole, both boreholes must be backfilled with cement grout in accordance with the requirements of the San Francisco Department of Public Health, unless piezometers are provided for recurrent water level monitoring.

Piezometers, multilevel piezometers, monitoring wells, and pumping wells must be installed at selected locations along the alignment to monitor groundwater levels and conduct permeability testing. Groundwater monitoring capability must be installed at all boreholes unless there is already a groundwater monitoring device available within 100 feet horizontally and 25 feet vertically. Consideration must be given to the installation of two or more multilevel piezometers at each area being monitored to allow for a thorough evaluation of groundwater flow characteristics. Regardless of the monitoring techniques used, both vertical and horizontal flow characteristics must be evaluated at locations where groundwater characterization is desired.

The installation of all groundwater monitoring facilities and groundwater monitoring must conform to the most recent applicable ASTM standards or other procedures approved by the TJPA. The necessary permits must be maintained during the life of these facilities and wells in accordance with the requirements of the San Francisco Department of Public Health.

For environmental groundwater investigation requirements. See CHAPTER 4, Environmental Requirements.

9.1.7 Downhole Geophysical Tests for Modulus Determination

Downhole geophysical testing must conform to the most recent applicable ASTM standards or other methods approved by the TJPA. Shear wave and P-wave velocity information must be collected to adequate depth to establish a reference the depth to a reference horizon.

9.1.8 In Situ Permeability Tests

Standpipe piezometers must be installed to isolate specific zones of rock or soil and to perform permeability tests. Appropriate test methods may include piezometer and pumping well test set-ups. The test methods and evaluation of the results must be in accordance with the USBR Earth Manual. The TJPA must approve any deviations from the procedures in the manuals.

9.1.9 Laboratory Testing

To the extent possible, laboratory testing must conform to the most recent applicable standards included in the Annual Book of ASTM Standards, Section 4, Construction, Volumes 04.08 and 04.09, Soil and Rock, or ISRM standards. Exceptions to the standard methods must be approved by the TJPA.

As a minimum, the following tests must be conducted in soil to establish the classification and engineering properties of each soil unit: laboratory visual classification, moisture content, unit weight, specific gravity, and sieve analysis. For fine-grained soils or fine-grained fractions of coarse-grained soils, hydrometer analysis and

Atterberg limits tests must be conducted to assist with soil classification and the evaluation of engineering characteristics.

One or more of the following tests—consolidation tests, drained triaxial tests, direct simple shear tests, consolidated undrained triaxial compression tests, or extension tests—must be conducted to evaluate other soil characteristics depending on the type of soil encountered. Soil abrasion testing must also be conducted in units that classify as sands or gravels and conform to the procedures developed by SINTEF in Trondheim, Norway (SINTEF 1998).

As a minimum, the following tests must be conducted in rock: unit weight, permeability, hardness, petrography, and strength. Strength testing depends on the type and condition of rock recovered and includes point load, Brazilian (splitting tension), triaxial compression, and unconfined compressive strength testing. Direct shear tests must be performed on rock discontinuities to conform to the most recent applicable ASTM standards.

As a minimum, testing must be conducted to establish design values for Poisson's ratio and the friction angle of each type of rock expected to be encountered in the tunnel heading and at least one tunnel diameter above and below the heading. Rock abrasion testing using the AVS test and rock hardness using the Sievers' J-value SJ test must be conducted as described by SINTEF. Rock abrasion testing using the CERCHAR abrasivity index test also be conducted. Mineralogy and petrographic analysis must be performed for each rock type. Representative samples of rock identified as containing asbestiform must be submitted for X-ray diffraction testing to evaluate for the presence of asbestos fibers.

The designer is responsible for proposing for the TJPA's approval the number of each type of test necessary to adequately characterize each soil or rock unit encountered. The designer is responsible for obtaining enough testable samples of rock and soil to complete the agreed-upon laboratory testing program. Therefore, additional subsurface exploration and sampling may be necessary to obtain the adequate number of samples for subsurface characterization.

Regardless of whether soil or rock is encountered, corrosion testing must also be conducted, as necessary, to characterize the corrosion potential of materials encountered along the alignment.

If the designer wishes to use tests not covered in the current ASTM or ISRM standards, the designer must propose test methods to the TJPA for approval.

9.2 Geotechnical Reporting

Present the results of the geotechnical studies in the following geotechnical documents:

Geotechnical Data Report (GDR). All geotechnical data obtained for the project must be compiled in a GDR to be made available to bidding contractors or included as construction contract documents, or both. The GDR must include the following:

- Results of all geotechnical explorations, such as boreholes, Cone Penetration Test s, geophysical tests, vane shear tests, and any other tests that might be included in the investigation
- Results of all laboratory tests performed on soil samples and rock cores
- Evaluation of the effects of groundwater drawdown

- Summaries of relevant site data from other investigation sources like Caltrans and previous projects at or next to the project site
- Detailed results and tabulated summaries of the data and appropriate graphical presentations of the data to facilitate efficient and easy use of the data by designers and contractors alike
- Alignment profile showing boring stick logs with offset from profile centerline
- Calibration data for all installed instruments, such as piezometers or other monitoring devices, and hammer energy measurements for drilling rig SPT hammers.
- A signature and stamp of the California-registered geotechnical engineer responsible for compiling the GDR
- A digital transmittal of the gINT database (or equivalent) used to develop the log of test borings
- All laboratory test results in MS Excel format or other digitally tabulated format
- All Cone Penetration Tests and Seismic Cone Penetration Test data
- All other field data collected in digital format (e.g., geophysical data, groundwater measurements both manual and digital, and site photographs)

Do not include any interpretation of the data in the GDR.

Geotechnical Reference Materials (GRM). The GRM is a compilation of geotechnical reports procured by the TJPA and project geotechnical engineering consultants, including reports from the San Francisco Department of Building Inspection archives, that provides contextual geotechnical conditions near the project. The GRM is for reference only and must not be relied on for design.

Geotechnical Interpretive Report (GIR). The GIR includes design parameters for the project and may be organized as a collection of design memoranda. The GIR must include the following discussions:

- Interpretation of the results of the geotechnical explorations
- Detailed subsurface profiles
- Appropriate design parameters for the major soil strata and rock units
- Recommendations for design groundwater levels
- Results of engineering analyses
- Construction considerations
- Recommendations for excavation, shoring, and dewatering
- Instrumentation and monitoring during construction
- Deep and shallow foundation design for vertical and lateral loading as well as estimates of settlements for all structures including the tunnel and ancillary items like overhead contact system (OCS) poles, equipment pads, and operations and maintenance facilities
- Evaluation of ground deformations that may be caused by excavations, and the impacts of this on existing adjacent structures
- Hydraulic design inputs received for geotechnical consideration, such as flood elevation, tidal variation, and sea level rise

- Design parameters for rock and rock discontinuities, such as joint spacing, dip angle, and dip directions
- Seismic design parameters, such as shear wave velocity and dynamic strength parameters of soil and rock units and stiffness reduction curves for dynamic loading

A preliminary engineering phase GIR must be prepared and submitted to the TJPA for approval. The preliminary GIR is a reference document and must not be relied on for Final Design in a design-build procurement. In a design-build procurement, the GIR must include the design-builder's interpretations of the soil conditions to be encountered during construction. Completion of the GIR will be a hold point prior to commencement of tunnel excavation.

Memoranda. Memoranda consist of geotechnical calculations submitted with a register showing a list of the calculations and the latest version of each calculation. Superseded versions of the calculations must be maintained on the register and clearly indicated as superseded, with the current version of the calculation clearly referenced.

A basis-of-estimate memorandum must be prepared describing the basis for selection of geotechnical and geological design and construction parameters as well as recommended parameters to be used in the construction cost estimate. For example, a basis-of-estimate document will be prepared for ground improvement, describing the layout of ground improvement columns or zones and anticipated takes of cement, grout, or other materials that may be injected into the ground.

Geotechnical Baseline Report (GBR). A GBR must be prepared for the mined tunnel portion of the project only, in accordance with the recommendations and list of required content from the Underground Technology Research Council (ASCE 2007). The GBR serves as a summary of the GDR and GIR and is the contractual document included in the contract procurement. The GBR must focus on the geotechnical and groundwater conditions to be encountered during tunnel construction and must not include design parameters.

9.3 Ground Improvement Methods

Geotechnical studies must consider the applicability of ground improvement methods to improve the performance of the structures, reduce project cost, or accelerate the construction schedule, or a combination of these.

Ground improvement methods may be used to mitigate liquefaction, improve the base stability of excavations, control groundwater, reduce excavation-induced deformations, improve the stability of tunnel excavation, and strengthen the foundations of adjacent structures. Proposed analytical and design methods for these specialized techniques must be submitted to the TJPA for approval.

Specifications for techniques such as permeation grouting, jet grouting, compaction grouting, soil-cement mixing, ground freezing, compensation grouting, and other stabilization measures must be developed in accordance with geotechnical recommendations.

Strength improvements to native soil provided by ground improvement techniques will be considered temporary unless demonstrated to be capable of performing throughout the project design life and accepted by the TJPA.

9.4 Excavation Base Stability

Basal heave and hydrostatic analysis must be conducted for excavations for temporary and permanent facilities.

9.4.1 Basal Heave

The evaluation of excavation stability against basal heave must follow generally accepted soil mechanics principles to address the risk of base failure due to heave. The strength parameters used in the analysis must reflect the zone where the soil is subjected to shear deformations and recognize anisotropic effects on the shear strengths of soft soils. Factors of safety against basal heave must not be less than 1.5 (Clough and O'Rourke 1990), unless detailed analyses demonstrate that the ground deformations that may be used are within acceptable tolerances, as recommended by the geotechnical engineer and approved by the TJPA. The minimum factor of safety against hydrostatic uplift will be 1.3 (Bowles 2001).

9.4.2 Hydrostatic Uplift

The stability of the base of the excavation against hydrostatic uplift forces must be evaluated, both at maximum excavation depth and at intermediate stages. The minimum factor of safety against hydrostatic uplift will be 1.3. Achieving this factor of safety may require groundwater lowering by dewatering, use of relief wells, or ground improvement below the excavation subgrade to increase the soil strength and resistance against uplift, or a combination of these methods.

Basal heave and hydrostatic analysis must be conducted for excavations for temporary and permanent facilities.

9.5 Groundwater Control

Design analyses criteria must be developed for lowering the groundwater, where necessary, for construction. The analyses must evaluate the potential for settlements caused by dewatering and the likely impacts of these settlements on adjacent structures. The potential extent of groundwater drawdown around the site caused by dewatering of the site must be evaluated by pump tests and hydrogeologic evaluations. The analyses must develop limits for groundwater lowering or mitigation measures where the groundwater lowering exceeds the limits set by the results of the analyses. The analyses of ground movements resulting from groundwater control must be incorporated into the analyses of potential damage to adjacent properties (including buildings, utilities, and infrastructure), as discussed in CHAPTER 11PROTECTION OF EXISTING INFRASTRUCTURE.

The necessary tests must be performed to evaluate the anticipated quality and quantity of groundwater to verify that the discharge will meet the San Francisco Public Utilities Commission's (SFPUC) Requirements Manual's criteria for disposal of groundwater from dewatering into the sewer system. If necessary, on-site treatment must be designed to improve the quality of the discharge to meet SFPUC's criteria for disposal in the sewer system.

Design and implementation of groundwater control during construction must achieve the requirements stipulated in the Final SEIS/EIR.

9.6 Instrumentation and Monitoring

Effective instrumentation and monitoring of ground movements and the movement of existing structures within and surrounding the zone of influence of the project work, structures under construction, and other facilities is required to manage and document the extent of construction impacts. The purpose of the instrumentation is to

- monitor (a) the effectiveness of the contractor's operations including dewatering and excavation and (b) indications of unacceptable conditions, such as excessive vibration and ground or structural movement, in and next to the project area as defined and approved by the TJPA.
- confirm lining shape using convergence monitoring and absolute survey.
- facilitate control of the impacts of construction operations on existing structures, utilities, and other facilities within or next to the project area as defined and approved by the TJPA.
- confirm design assumptions and design adequacy by verifying that the actual measurements, tolerances, deformations, and other parameters are within the limits assumed during design.
- monitor post-construction performance.

Instrumentation must be installed near the tunnel, braced excavations, vent shafts, and other facilities to accomplish these objectives.

Instruments to be used, as needed, are divided into two types: those that provide information concerning groundwater levels and pressures and those that provide information concerning ground, rail, and building and structure movements.

An instrumentation and monitoring program must be developed to address tunnel wall displacements, vibrations, and other issues related to construction. For buildings, utilities, and other infrastructure identified in the Final SEIS/EIR or addenda as being sensitive or historically significant, the instrumentation and monitoring system must be designed to employ at least two independent measurements, such as inclinometers coupled with surface survey markers, or combinations of tiltmeters, crack gauges, and arrays of survey prisms to monitor displacement and rotation of building facades.

A specification detailing information regarding the designing, furnishing, installing, monitoring, reading, recording, maintaining, and protecting of these devices must be developed for the TJPA's review.

Subsections 9.6.1, Groundwater/Ground Movement Measuring Devices and subsection 9.6.2, Monitoring Schedules, describe the groundwater and ground movement measuring devices to be used in the instrumentation and monitoring program. See also CHAPTER 10, Seismic Design.

9.6.1 Groundwater/Ground Movement Measuring Devices

Groundwater measuring devices may consist of monitoring wells of the open standpipe type, wellpoint piezometers, and other devices as established by the geotechnical engineer in design memoranda. The primary functions of these instruments are to

- permit monitoring of the groundwater level for compliance with limitations on the permissible amount of drawdown established for environmental or other reasons.

- ascertain that the groundwater level has been adequately lowered prior to commencement of excavation, as it is essential to (a) exclude water from tunnel headings insofar as possible and (b) minimize the potential for excessive water leakage and detrimental soil movement into braced excavations.

Groundwater measuring devices may also be used to (a) give an overall indication of the water level in selected areas where grouting may be used; (b) reveal the presence of local pockets of ground that may not have been dewatered, and (c) to monitor changes in pore pressure during construction.

Ground Movement Measuring Devices. Ground movement measuring devices may consist of a combination of the devices described in this section and other devices as established by the geotechnical engineer in design memoranda and as approved by the TJPA.

Building Settlement Markers. Settlement markers are used, as needed, on walls and columns of structures both parallel and perpendicular to the alignment. Certain types of these markers, in addition to being used to monitor settlement, can also be used together with an extensometer tape to check for lateral separation of building walls perpendicular to the alignment. Data from these instruments is used to assess the need for changes in construction procedures should movements resulting from construction be excessive.

Surface Movement Markers. Two types of surface movement markers are used, as needed. One type, which is set directly at ground surface, reflects the movement (settlement or heaving caused by grouting or other causes) of the surface itself and other facilities next to it. The second, which is set into the ground directly beneath the pavement, is used to detect settlements that may be masked by the bridging.

Subsurface Movement Markers. These markers are used, as needed, to detect movements above tunnel excavations to assess the need for changes in construction procedures to limit ground movement should movements exceed tolerable amounts.

Inclinometers. Inclinometers are used, as needed, at critical locations to evaluate ground movements and assess the adequacy of the contractor's operations and temporary ground support systems in preventing movement of the adjacent ground and structures. Inclinometers may be attached to boreholes, the reinforcing cages of walls, or the soldier beams.

Multiple Position Borehole Extensometers. Multiple position borehole extensometers are used where deemed essential to monitoring ground settlement at various depths, over and next to tunnels and shaft walls at various distances from the face of the excavation.

Optical Surveys. Optical surveys are used to monitor the vertical and horizontal movement of. building and ground settlement markers.

Automatic Total Station. Robotic total station is used for real-time settlement and horizontal movement monitoring of displacement-sensitive facilities.

In-Place or Portable Seismographs. Seismographs are used to monitor movements and vibrations resulting from the dynamic actions of operations or construction activities.

Crack Gauges. Crack gauges are used to monitor the changes of surface and building crack widths.

Tiltmeters. Tiltmeters are used in concert with surface movement markers, crack gauges, and optical surveys to monitor the tilt of building walls or other structures.

Manometers/Floor Level Sensors. Within buildings, floor level sensors are used on a periodic or continuous basis to monitor the level of the floor and changes in the level. This is especially important for structures with slabs-on-grade that could be subject to cracking resulting from differential settlement or differential horizontal strain.

9.6.2 Monitoring Schedules

Monitoring schedules for each type of instrument installed must be established. The data must be submitted bi-weekly (during design) and in real-time (during construction) to the TJPA for assessment to allow time for corrective action, if necessary. Because data collection is largely automatable, in-tunnel convergence monitoring devices and groundwater readings from automated sensors, such as dataloggers with remote communication capabilities, must be collected no less frequently than once per hour.

9.6.3 Deformation Trigger Levels

Values of measurements that will trigger the need for corrective action, referred to as trigger levels, must be specified in the contract documents and provided to field staff taking the measurements as well as to those responsible for evaluating the data. Monitoring data obtained from instruments during construction must be compared to the trigger levels included in the specifications on an ongoing basis.

The geotechnical engineer must establish allowable trigger levels by engineering analysis that models the construction process and estimates the anticipated or allowable deformations. Based on these evaluations, a multi-level observation system must be established that identifies threshold action, and possible shut-down levels. These levels must be established for individual instruments or instrument groups. The values used for threshold and action levels will depend on the physical asset (e.g., surface structure, subsurface structure, utility) to be monitored and the anticipated tunneling performance (i.e., ground response to tunnel excavation and support) and must be provided on a case-by-case basis by the engineer in the contract documents and approved by the TJPA.

CHAPTER 10 SEISMIC DESIGN

SCOPE

This chapter establishes the requirements for the seismic design of permanent structures for the Downtown Rail Extension (DTX) project including mined tunnel final linings, cut-and-cover structures, retaining structures, slopes, bridges, and buildings and surface facilities. In addition, criteria for temporary structures, including the mined tunnel initial support and the cut-and-cover excavation support structure, are provided.

The seismic design criteria are divided into categories by structure type—permanent underground structures, retaining structures, temporary underground structures, bridges, buildings and surface facilities, and non-structural components. The design requirements for each of these categories differ.

The design approach for permanent underground structures is based on a dual seismic criterion for two design earthquake levels, consistent with the American Association of State Highway and Transportation Officials Load and Resistance Factor Design Road Tunnel Design and Construction Guide Specifications (AASHTO LRFD Road Tunnel). The lower-level event is referred to as the Functionality Evaluation Earthquake (FEE), during and after which the designed structures must respond in an elastic manner and the facility is to remain operational. The structure must also be designed to withstand a high-level event with no collapse and no inundation for the protection of life safety; this is referred to as the Safety Evaluation Earthquake (SEE). The structures subject to the SEE may be designed to respond in an inelastic manner, but any structural damage must be limited to the minimal level that is repairable within a specific period of time. The seismic performance criteria for each earthquake level are referred to in Section 10.4.1 of AASHTO LRFD Road Tunnel. The FEE and SEE must be defined in the form of 5 percent damped horizontal and vertical response spectra, as follows:

FEE is defined by the larger of a probabilistic response spectrum based on a 10 percent probability of exceedance in 50 years (i.e., a return period of approximately 475 years) and a 67th percentile deterministic response spectrum.

SEE is defined by the larger of a probabilistic response spectrum based on a 5 percent probability of exceedance in 50 years (i.e., a return period of approximately 975 years) and an 84th percentile deterministic response spectrum.

CODES, STANDARDS AND GUIDELINES

Seismic design of the DTX must confirm to the latest edition of the following codes, standards, and guidelines unless otherwise specified in these criteria:

- American Association of State Highway and Transportation Officials LFRD Road Tunnel Design and Construction Guide Specification (AASHTO LRFD Road Tunnel).
- American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering
- American Society of Civil Engineers/Structural Engineering Institute – ASCE/SEI 7, Minimum Design Loads for Buildings and Other Structures

- ASTM International standards, Code ASTM A706, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
- California Building Code (CBC)
- California Department of Transportation (Caltrans) Memo to Designers 20-1, Seismic Design Methodology
- California Department of Transportation (Caltrans) Memo to Designers 20-16, Seismic Safety Peer Review
- Caltrans Seismic Design Criteria (SDC)
- Caltrans Trenching and Shoring Manual
- Peninsula Corridor Joint Powers Board - Caltrain Standards for Design and Maintenance of Structures
- Peninsula Corridor Joint Powers Board – Caltrain Standards for Excavation Support Systems
- San Francisco Building Code(SFBC), San Francisco Department of Building Inspection, Administrative Bulletin-082 Guidelines and Procedures for Structural Design Review
- San Francisco Building Code (SFBC), which includes San Francisco Code Amendments (SF Amendments)

REFERENCES

The following references may also be used in support of the analysis and design of permanent underground structures for the DTX:

Bozorgnia, Y. and K.W. Campbell. 2016. “NGA-West2 ground motion model for the vertical-to-horizontal ratio of PGA, PGV, and linear response spectra.” Earthquake Spectra Vol. 32: 951–978.

Donahue, J. L., J. P. Stewart, N. Gregor, and Y. Bozorgnia. May 2019. Ground-Motion Directivity Modeling for Seismic Hazard Applications. Review Panel: J. D. Bray, S. A. Mahin, I. M. Idriss, R. W. Graves, T. Shantz. Pacific Earthquake Engineering Research (PEER) Center Report No. 2019/03.

Gülerce, Z. and Abrahamson, N.A. 2011. “Site-specific design spectra for vertical ground motion.” Earthquake Spectra Vol. 27 No. 4: 1023-1047.

Hashash, Y. M. A., J. J. Hook, B. Schmidt, and J.I.-C Yao. 2001. “Seismic design and analysis of underground structures.” Tunneling and Underground Space Technology 16: 247-293.

Hashash, Y. M. A., D. Park, and J. I.-C Yao. 2005. “Ovaling deformations of circular tunnels under seismic loading, an update on seismic design and analysis of underground structures.” Tunneling and Underground Space Technology, 20 (2005): 435-441.

Hashash, Y. M. A., K. Karina, D. Koutsoftas, and N. O'Riordan. 2010. “Seismic design considerations for underground box structures.” In Proceedings of the 2010 Earth Retention Conference. Geotechnical Special Publication Vol. 384, No. 208 GSP.

Hayden, C. P., J. D. Bray, and N. A. Abrahamson. 2014. “Selection of near-fault pulse motions.” Journal
of Geotechnical and Geoenvironmental Engineering Vol. 140, Issue 7.

Mononobe, N. and H. Matsuo, October 22-28, 1929. “On the determination of earth pressures during earthquakes.” In Proceedings of the World Engineering Congress, Tokyo, Japan.

National Cooperative Highway Research Program (NCHRP) 2008. Seismic Analysis and Design of Retaining Walls, Buried Structures, Slopes, and Embankments. Report 611.

Newmark, N. 1965. “Effects of earthquakes on dams and embankments.” Geotechnique Vol 15, No 2: 139-160.

Okabe, S. 1926. “General theory of earth pressure.” Journal of the Japanese Society of Civil Engineers, Tokyo, Japan: 12.

Ostadan, F. and J. Penzien. 2001. “Seismic Design of Cut-and-Cover Sections of the Bay Area Rapid Transit Extension to San Francisco Airport.” Second U.S.-Japan Workshop on Soil Structure Interaction, Tsukuba, Japan: March 6-8, 2001.

Penzien. 2000. “Seismically induced racking of tunnel linings.” Earthquake Engineering and Structural Dynamics 29: 683-691.

Power, M.S., D. Rosidi, J. Kaneshiro, S.D. Gilstrap, and S-J. Chiou. 1998. “Summary of Evaluation of Procedures for the Seismic Design of Tunnels.” Draft Report.

Seed, H.B. and R.V. Whitman. 1970. “Design of Earth Retaining Structures for Dynamic Loads.” Lateral Stresses in the Ground and Design of Earth-Retaining Structures. American Society of Civil Engineers: 103-147.

Shahi, S.K. and J.W. Baker. 2011. “An empirically calibrated framework for including the effects of near-fault directivity in probabilistic seismic hazard analysis.” Bulletin of the Seismological Society of America Vol. 101, No. 2: 742-755.

Wang, J.-N. 1993. “Seismic Design of Tunnels: A State-of-the-Art Approach.” Monograph 7. Parsons Brinckerhoff Quade & Douglas, Inc., New York.

Whitman, R. V. 1990. “Seismic Design and Behavior of Gravity Retaining Walls,” American Society of Civil Engineers Geotechnical Special Publication 25 Design and Performance of Earth Retaining Structures: 817-842.

The geotechnical reports and memoranda prepared for the DTX project must also be consulted. These reports may be updated if additional investigations are warranted when work on the Geotechnical Baseline Report begins. See CHAPTER 9 Geotechnical Requirements.

10.1 Seismic Hazard

The project area is located within a high-seismicity region characterized by the San Andreas Fault system, which is the principal tectonic element of the North American/Pacific plate boundary in California. In the San Francisco Bay Area, seismic slip is partitioned onto subsidiary structures, such as the San Andreas, Hayward, and Calaveras faults, that are distributed across the Coast Ranges province. The San Andreas and Hayward faults have the highest slip rates and are the most active of any faults in the Bay Area. Other important earthquake sources that are capable of producing large-magnitude earthquakes include the San Gregorio, Calaveras, Rodgers Creek, and Greenville fault zones.

Both probabilistic and deterministic seismic hazard assessments, probabilistic seismic hazard assessment or assessments (PSHA) and deterministic seismic hazard assessment (DSHA), respectively, must be performed by developing seismic hazard models accounting for the regional tectonic setting, seismicity, and geology. The hazard models must capture the expected recurrence rate and maximum magnitudes of active faults and seismic source zones, the characteristics of the ground motion attenuation from source to site, and the effects of local site conditions including their uncertainties. The seismic hazard models must be consistent with the National Seismic Hazard Model by the United States Geological Survey adopted by the latest design standards (e.g., ASCE/SEI 7) at the time of design. The controlling earthquakes (i.e., pairs of magnitude and distance) must be determined based on the hazard deaggregation from PSHA for the design level hazards and spectral periods of interest.

The seismic hazard assessments must be conducted for reference horizon conditions. A reference horizon must be defined at the depth of the top of a competent material or rock unit, which must be sufficiently deep below the entire underground structures of interest. Also, the upper 30-meter time-averaged shear wave velocity (V_{S30}) must be defined for the reference horizon. The reference horizon must be used as the elastic half-space in seismic-site response analyses, where outcrop input ground motions are applied. See subsection 10.2.2, Site Response Analysis.

As the project covers a large area, the variation of seismic hazards along the project alignment must be estimated and reflected in developing design ground motions.

For near-fault sites, the rupture directivity effects on ground motions must be assessed for both FEE and SEE spectra. Near-fault sites are defined as follows, in accordance with section 11.4.1. of ASCE/SEI 7.

- Within 9.5 miles of the surface projection of a known hazardous fault capable of producing earthquake magnitude 7 or larger events

  Or

- Within 6.25 miles of the surface projection of a known hazardous fault capable of producing earthquake magnitude 6 or larger events.

Multiple directivity models are available. PEER Center Report No. 2019/03, Ground-Motion Directivity Modeling for Seismic Hazard Applications, summarizes five directivity models developed in the Next Generation Attenuation – Western U.S. (NGA-West2) and presents five approaches for the implementation of the directivity models (Donahue et al. 2019). One of the five approaches must be used in the assessment of directivity effects. Other directivity models and application approaches may be considered and must be approved by the Transbay Joint Powers Authority (TJPA).

The seismic hazard assessments for all structure types included in the DTX project must be peer-reviewed in accordance with Section 10.10and approved by the TJPA.

10.2 Design Ground Motions

The designer must develop design ground motions at depths of interest in terms of 5-percent damped horizontal and vertical design response spectra associated with the FEE and SEE events for the permanent underground structures and retaining structures. The horizontal design response spectra at reference horizons must be determined by the seismic hazard assessments. See Chapter 10, section 10.1, Seismic Hazard. Then, the horizontal design response spectra at depths of interest must be computed by performing site response analyses with the input of the reference horizon ground motions and site-specific subsurface models. See subsections 10.2.1, Design Ground Motion Time Histories at Reference Horizon and 10.2.2, Site Response Analysis.

The design response spectra for the vertical component of FEE and SEE ground motions must be based on the application of an appropriate vertical to horizontal (V/H) spectral ratio to the horizontal design response spectra at depths of interest from the site response analyses. V/H ratios must be estimated using empirical V/H models (Gülerce and Abrahamson 2011 and Bozorgnia and Campbell 2016) along with the controlling earthquakes (i.e., pairs of magnitude and distance) based on the hazard deaggregation from PSHA; see Section 10.1, Seismic Hazard.

The design ground motions along with time histories and site response analyses must be peer-reviewed in conformance with Section 10.10and approved by the TJPA.

10.2.1 Design Ground Motion Time Histories at Reference Horizon

For each reference horizon design response spectrum, a minimum of eleven sets of outcrop ground motion time histories must be developed using recorded ground motions appropriate for the characteristics of the controlling earthquakes, including strong ground motion durations and local site conditions. Appropriate simulated ground motions may supplement the suite of recorded ground motions if necessary. Each set must consist of two horizontal components and one vertical component. In time history analyses, the average response from the full suite of time histories must be used in the design.

The time histories must be modified to be compatible with their associated target design response spectra by either amplitude scaling approach, spectral matching approach, or both approaches. For either approach, the horizontal-to-horizontal period-dependent variability must be maintained for each set. The average horizontal response spectrum of two horizontal components for a given set must be within +/-20 percent of the target design response spectrum over the periods of interest. For a full suite of time history sets, the average of all eleven horizontal spectra must be within +/-5 percent of the target design response spectrum over the periods of interest. Also, the suite of modified time histories must have the engineering characteristics such as peak ground motion parameters, Arias intensity, and strong motion durations suitable for the controlling earthquakes and target design response spectra. Empirical correlations may be used for appropriate means and ranges of the engineering characteristic parameters. In addition, the non-stationary characteristic must be maintained between the initial seed time history and the modified time history.

For near-fault sites, pulse-like motions from forward-directivity effects must be included in the suite of time histories, and the original pulse characteristics of the seed time histories must be maintained in the modified time histories. The selected number of pulse-like motions may be estimated from empirical models (e.g., Hayden et al. 2014; Shahi and Baker 2011) along with the PSHA hazard deaggregation information in Section 10.1, Seismic Hazard.

10.2.2 Site Response Analysis

Site response analysis of representative subsurface models must be performed to determine free-field ground motions at desired depths. The subsurface models must include the soil units/layers from the ground surface below the bottom of the underground structures of interest down to the reference horizon; see Section 10.1. The reference horizon time histories must be input as outcrop motions from the reference horizon as the elastic half-space. A subsurface model must consist of an idealized soil stratigraphy, small-strain shear wave velocities and damping, nonlinear shear modulus reduction and damping curves, and unit weights. The nonlinear curves must be selected from published models for similar soil or derived from laboratory tests. The selected nonlinear models must be adjusted so that their implied shear strengths are comparable to the estimated shear strengths of site soil based on site investigation data.

The site response analyses must be performed using both equivalent linear and nonlinear techniques. An adequate technique must be adopted considering the level of nonlinearity in soil response and their result comparison.

For liquefiable soil, a one-dimensional, two-dimensional or three-dimensional site-response analysis must capture the local extent of the potentially liquefiable soil layer if applicable.

10.3 Permanent Underground Structures

The cross sections of the mined tunnel and cut-and-cover structures must be sized to satisfy dynamic load considerations. Thereafter, the design must be checked for its ability to resist the anticipated earthquake ground motions and forces.

The general procedure for the seismic design of permanent underground structures must be based primarily on the ground deformation approach. During earthquakes, underground structures move with the surrounding ground. The structures, therefore, must be designed to accommodate the deformations imposed by the ground.

10.3.1 Analysis

Underground tunnel structures undergo three primary modes of deformation during seismic shaking: ovaling/racking, axial, and curvature deformations. The ovaling/racking deformation is caused primarily by seismic waves propagating perpendicular to the longitudinal axis of the tunnel. Vertically propagating shear waves are generally considered the most critical type of waves for this mode of deformation. The axial and curvature deformations are induced by components of seismic waves that propagate along the longitudinal axis. The effects of all three modes of deformation must be considered in the design of the permanent underground structures.

Axial compression and tension and longitudinal bending must be analyzed simultaneously to ensure that strains remain within acceptable limits using closed form solutions.

For tunnels and cut-and-cover structures, the techniques proposed by Ostadan and Penzien (2001) and Hashash et al. (2001, 2005, and 2010) must be followed. In general, the analyses must include the following analyses:

- Pseudostatic analysis under which the structure's response to prescribed free-field earthquake deformations is evaluated
- Dynamic soil-structure interaction analyses

The need for dynamic soil-structure interaction analyses and the scope of the analyses must be determined by the designer and accepted by the TJPA. Numerical modeling simulations are generally required for full dynamic analyses. The results of the pseudo-static analyses must be used as a basis for determining the scope of the more detailed dynamic analyses, and whether two-dimensional or three-dimensional analyses may be required. In the soil-structure analysis, elastic models are acceptable if the structural response remains elastic. In elastic analysis, an appropriate fraction of the Ig (e.g., 0.5 Ig) must be used if cracked slabs/walls are considered while the Ig must be used if uncracked slabs/walls are considered. If the structural response is into inelastic range, non-linear analysis must be performed, and the resulting strains must be evaluated.

Given the anticipated length of the underground box structures, several representative two-dimensional analyses must be used to check different ground conditions. Where there are significant changes in tunnel geometry (including ventilation structure connections) and alignment, and/or soil stratigraphy (e.g., a tunnel from rock to soft soil site, or vice versa), a three-dimensional analysis of the tunnels must be completed. Numerical methods used to evaluate soil-structure interaction must be peer-reviewed and approved by the TJPA in conformance with section 10.10.

The results of the dynamic soil-structure interaction analyses must include structural deformations and forces.

In addition to maintaining structural capacity, the underground structure must also maintain its barrier to the ingress of flowing groundwater as a result of FEE and SEE events.

Load sharing between the temporary construction support and the final lining of the mined tunnel is not permitted.

If joints are proposed within the mined tunnel final lining, the designer must verify the magnitude of joint openings and ensure that adequate joint compression is maintained during seismic events. Ductile segmental joints must be designed as follows:

- No net tension across the joint is permitted.
- Joint shear capacity must be evaluated and compared to shear demands.
- Joint bearing and compressive capacity against its bearing surface must be evaluated and compared to applicable demands.

10.3.2 Seismic Load Combinations

The following seismic load combination, consistent with current standards of practice in the San Francisco Bay Area, must be used in the design of the permanent underground structures.

The transverse and longitudinal earthquake loads must be applied simultaneously in two directions in conformance with the Caltrans SDC and combined with the vertical earthquake loads.

The earthquake load must be included in Extreme Event T-I, as defined in Chapter 12, subsection 12.2.1, and AASHTO LRFD Road Tunnel.

10.3.3 Structural Component Design

For non-ductile structural components prohibited from inelastic deformation and structural components shown to behave elastically in a design earthquake, resistance factors are defined in AASHTO LRFD Road Tunnel.

For ductile structure components allowed to undergo inelastic deformation in a design earthquake, structure components must be designed according to the Caltrans SDC for global displacement, displacement ductility, overstrength demand, and capacity protection. Proper detailing at the ductile components must be provided to support overall seismic design through evaluating the displacement capacity of the structure, capturing its ductile non-linear response.

The design of permanent structural components, for which the design load, including seismic, is controlled by soil deformations and their structural capacities are controlled by ductile structural resistance modes such as bending, a displacement ductility ratio of 1.0 may be acceptable as the criteria for operability performance.

The shear capacities of concrete structures and structural components must be designed for, at a minimum, the strength demands, including strength demands based on seismic load combinations. Capacity protected members must be designed to resist the overstrength demands imparted by seismic critical members and sacrificial members in conformance to the Caltrans SDC. The shear capacity of seismic critical members must be designed to resist the overstrength shear associated with the overstrength moment in conformance to the Caltrans SDC. the strength demands, including strength demands based on seismic load combinations. Effective section properties of the walls must be used to evaluate demands associated with seismic racking. Structures designed for an inelastic behavior in a design earthquake SEE must be modeled by appropriate methods, accounting for material, component, and geometric nonlinearities. Special attention should be paid to the connections of all the structural members. Positive connections must be designed and detailed. The diaphragm walls and bracing struts should also
be checked for soil pressure generated by the localized liquefied soil.

10.3.4 Material Properties and Allowable Strains

- All steel bars for concrete reinforcement must conform to ASTM A706.
- Grade 60 must be used for all seismic-critical members.
- Do not use Grade 80 in seismic-critical members. Grade 80 may be used in capacity-protected members.
- Caltrans SDC provides values and formulations for expected material properties.
- Based on the analyses described, strains should not exceed those indicated in Table 10-1.

Table 10-1: Allowable Strains

	Mined/Bored Tunnel Liner		Cut-and-Cover Structure		
				Steel in Tension*	
Earthquake	Concrete in Compression	Steel in Tension*	Confined Core Concrete in Compression	#10 and Smaller	#11 and Larger
FEE	0.002	0.002	0.0025	0.020	0.020
SEE	0.0033	0.02	0.0050	0.080	0.60

10.3.5 Ventilation/Access Shafts

The seismic considerations for the design of vertical shaft structures are similar to those for the mined tunnel structure. Consideration must be given to the curvature strains and shear forces of the lining resulting from vertically propagating shear waves. Force and deformation demands may be critical in cases where shafts are embedded in deep, soft deposits.

In addition, potential stress concentrations at the following critical locations along the shaft must be properly considered: (1) abrupt change of the stiffness between two adjoining geologic layers, (2) shaft/tunnel or shaft/station interfaces, and (3) shaft/surface building interfaces.

10.3.6 Interface Joints

Flexible joints must be provided at locations identified in Chapter 12, subsection 12.2.2, Serviceability Requirements. In addition, flexible connections must be used between any two structures in poor ground conditions that have stiffness-to-mass ratios outside of the following range:

Equation 10.1. Stiffness-to-Mass Ratio Range Threshold

$$0.75 \leq \frac{k_i^e / m_i}{k_j^e / m_j} \leq 1.33$$

Where

k_i^e = effective stiffness of structure i
k_j^e = effective stiffness of structure j
m_i = mass of structure i
m_j = mass of structure j

The design movements (peak relative displacements) must be established from dynamic analysis and presented in design memoranda.

10.4 Retaining Structures

Retaining walls and u-wall structures must be designed for appropriate static and seismic soil and water pressures depending on the restraining conditions of the wall in accordance with AASHTO LRFD Road Tunnel.

For shallow embedded structures, the stability of the structures against flotation due to uplift forces induced from liquefied soils below the base of the structures must be evaluated and considered in the design.

10.4.1 Seismic Design of Retaining Structures

Several types of retaining structures may be built, including gravity retaining walls, mechanically stabilized earth walls, cantilevered retaining walls, and anchored walls. U-walls may also be built using gravity or other retaining systems. Seismic loading estimates for these walls must be based on whether the wall is yielding or non-yielding. Design considerations related to wall types are discussed in the following Sections. U-walls must

be classified as either yielding or non-yielding and analyzed in conformance with the appropriate procedures discussed in Chapter 10, subsection 10.4.2, Seismic Loading on Yielding Retaining Structures, or subsection 10.4.3, Seismic Loading on Rigid (Non-Yielding) Retaining Structures.

10.4.2 Seismic Loading on Yielding Retaining Structures

Yielding retaining structures are those that can tolerate active earth pressures behind the structure and may deflect to mobilize them.

Seismic loading must be estimated by adding a seismic pressure to the static pressure with consideration of the inertial force of the wall when earthquake accelerations are applied. Active seismic pressures on retaining structures must be estimated using Mononobe-Okabe (M-O) analyses or general limit equilibrium method as described in NCHRP Report 611. The M-O analysis must not be employed if any of the following conditions is not met:

- The soil wedge supported by the retaining wall consists of homogeneous, dry, and cohesionless soil.
- The soil failure plane is much steeper than the backfill slope.

If the M-O analysis is inadequate, general limit equilibrium method or alternate approaches must be used such as described in AASHTO LRFD Road Tunnel.

Additional considerations are required if liquefaction is anticipated in the ground behind the walls in either seismic event. The M-O method is not directly applicable in these cases. Liquefiable soils near the walls at the structures must be removed and replaced with engineered fill or remediated, or the design of retaining structures must accommodate anticipated loads from liquefied soils behind the wall subject to both FEE and SEE.

10.4.3 Seismic Loading on Rigid (Non-Yielding) Retaining Structures

Rigid retaining structures are defined as those that are restrained enough to preclude the amount of deflection required to mobilize active earth pressures along the wall. A deformation-based soil-structure interaction analysis or a racking analysis based on free-field seismic shear strains, similar to the racking analysis discussed in subsection 10.3.1, Analysis, must be conducted.

10.4.4 Factors of Safety for Earth Retaining Structures under Seismic Loading

Failure modes of retaining structures are grouped into three categories: sliding, overturning, and bearing capacity. The seismic criteria for each of these failure modes are discussed as follows:

Sliding: A factor of safety of 1.15 is required for sliding in the FEE event. The factor of safety for sliding during the SEE event must be estimated but must not control the design (permanent displacement of wall controls the design). Instead, calculated wall displacements must be evaluated if a factor of safety less than 1.0 is estimated for sliding during the SEE. The wall must be designed such that any permanent deformation of the wall resulting from the SEE event must not compromise running clearances, as described in CHAPTER 7, Guideway Geometrics.

Overturning. Overturning stability must be maintained through limiting the maximum eccentricity based on the following formula:

Equation 10.2. Overturning

$$e_{max} \quad \leq B/6 \text{ for FEE}$$
$$\leq B/3 \text{ for SEE}$$

Where

e_{max} is the maximum eccentricity.
B is the width of the base of the retaining wall footing.

Bearing Pressure. Soil bearing pressure below retaining structures must be estimated for both FEE and SEE.

Seismic-induced deformations, settlements, and displacements of retaining structures must be evaluated based on the local geometry and the requirements of the structure and track supported by the retaining structures. CHAPTER 10STRUCTURES, referred to limits on maximum permissible deformations, settlements, and displacements.

In addition, the factor of safety for the overall retaining structure and slope should be evaluated, as discussed in Section 10.4.4, Factors of Safety for Earth Retaining Structures under Seismic Loading.

10.5 Temporary Underground Structures

The seismic design of temporary underground structures including support of excavation and initial support of the mined tunnel with an expected use duration of five years or less must be based on ground motions with a 10 percent probability of exceedance in ten years, corresponding to a return period of approximately 100 years. Temporary underground structures must be designed to resist increases to lateral soil pressure due to a seismic event.

For temporary structures with an expected use duration of over five years, the seismic loading for permanent underground structures must be used. Inquiries on the definition of temporary underground structures must be directed to the TJPA for further specifications, if necessary.

10.6 Bridges

The seismic design of roadway bridges and roadway bridge temporary structures must conform to the Caltrans SDC.

The seismic design of railway bridges and railway bridge temporary structures must conform to the AREMA Manual for Railway Engineering.

10.7 Buildings and Surface Facilities

The seismic design of buildings, surface facilities, and temporary structures must conform to the SFBC, CBC, and ASCE/SEI 7.

10.8 Non-structural Components

Consideration must be given to the seismic design of all appurtenances to the tunnel—equipment, equipment supports, and anchorages, which include the tunnel finishes, fasteners, and connections for fans, lighting, signage, and other facilities. The seismic design of equipment, equipment supports, and anchorages must conform to the CBC and ASCE/SEI 7.

The design of essential equipment, defined as equipment required for safety (including fire protection, ventilation fans, and emergency power) or the operation of trains (including uninterruptible power supply (UPS), batteries, inverters, and power control equipment), may use an importance factor of 1.5. The structural design of non-structural components, such as ceiling elements, overhead lighting, and ventilation ducts, in areas of emergency egress, access, and assembly must use an importance factor of 1.5. Non-essential equipment, equipment supports, and anchorage outside of areas of emergency egress, access, and assembly may be designed using an importance factor of 1.0 where permitted by the applicable codes.

Equipment that is deemed essential and fragile may require dynamic analysis, with the approval of the TJPA.

10.9 Other Considerations

10.9.1 Liquefaction Considerations

Liquefaction triggering evaluation must be carried out for the FEE and SEE events in conformance with AASHTO LRFD Road Tunnel. Where liquefaction is anticipated for the design earthquake, mitigation measures must be recommended by the California-registered geotechnical engineer.

10.9.2 Seismically Induced Settlement and Lateral Spreading

Seismically induced settlement and lateral spreading analyses must be performed for both FEE and SEE events. Where the results of these analyses indicate the effects of settlement or lateral spreading to be detrimental to the performance of the DTX structures in achieving the specified design life, mitigation measures must be recommended by the California-registered geotechnical engineer.

10.9.3 Seismic Design of Reinforced and Unreinforced Slopes

Slope design at the portals within the excavation support system walls must confirm to the criteria discussed in this subsection. A finite amount of space must be available for the slopes. If adequate space is not available for the installation of unreinforced slopes to the required factors of safety, then slope reinforcement may be considered. Slope reinforcement techniques should be recommended by the geotechnical engineer, consistent with any requirements of the Caltrain Standards for Excavation Support Systems.

Seismic Design of Permanent Unreinforced Slopes

Unreinforced earth slopes must have minimum factors of safety noted in this subsection and must be no steeper than 2:1 horizontal to vertical ratio (2H:1V), which corresponds to a slope angle of approximately 26 degrees. Slopes may need to be shallower than this angle if adequate factors of safety cannot be attained for 2H:1V slopes.

Slope stability must be analyzed using pseudo-static limit equilibrium type analyses with applied seismic coefficients. The seismic coefficient in these analyses must be provided by the California-registered geotechnical engineer. A reduction in soil strengths may be necessary for these analyses. Soil strength reduction factors, if applicable, must be provided by the geotechnical engineer.

Regardless of the specific analysis method selected, the slope stability factor of safety must be greater than 1.2 in the FEE event. For the SEE event, the factor of safety must not control design of the slope. If the SEE factor of safety is less than 1.0, earthquake-induced lateral displacements must be evaluated using Newmark type analyses (Newmark 1965) in conformance with AASHTO LRFD Road Tunnel and NCHRP Report 611. The slope must be designed such that sliding resulting from the SEE event must not compromise DTX running clearances as described inCHAPTER 7, Guideway Geometrics. The seismic design of temporary slopes does not need to be explicitly considered, although temporary slopes are expected to conform to the requirements contained in the PCJPB Engineering Standards. Instead of pseudo-static limit equilibrium analyses and Newmark type analyses, a fully representative two-dimensional or three-dimensional numerical model may be used, but this approach must include a peer review and approval by TJPA.

10.10 Peer Review

This chapter identifies the engineering tasks requiring peer review. Peer reviews must conform to the specifications in this subsection in addition to the requirements in the Caltrans SDC (Memo to Designers 20-16) and the SFBC Administrative Bulletin AB-082, Guidelines and Procedures for Structural Design Review.

A peer reviewer or peer reviewers must be selected prior to initiation of significant portions of the engineering work to be reviewed. Peer reviewers must be California licensed engineers and recognized technical experts in the subject matter, familiar with governing regulations. They must be independent of the project with no other involvement with the project before, during or after the review. Peer reviewers must be approved by the TJPA before the peer review begins.

The peer review must be performed at an early stage throughout the duration of the work. Contractors must provide peer reviewers with a full range of data, models, and methods considered in the work in an organized fashion. Peer reviewers and contractors must document all comments and responses. Upon completion of the peer review, peer reviewers must submit directly to the TJPA a written report and a closure letter stating that the review process was completed, and all review comments were satisfactorily resolved. The report must summarize the peer review and include the following information:

- Scope of the peer review
- Status of the documents reviewed at each stage
- Key review comments and resolutions
- Limitations of the peer review, if applicable
- Formal documentation of all peer review correspondence

CHAPTER 11 PROTECTION OF EXISTING INFRASTRUCTURE

SCOPE

This chapter establishes the requirements for the protection of existing infrastructure next to the Downtown Rail Extension (DTX) alignment from ground movements—settlements, rotations, or both—resulting from excavation associated with the construction of the DTX cut-and-cover structures and tunnel. Existing infrastructure may include buildings, bridges, station platforms, tracks, utilities, and other physical assets near the DTX construction. This information must be used in conjunction with the 2018 Final Supplemental Environmental Impact Statement/Environmental Impact Report (Final SEIS/EIR) prepared for the Transbay Program and the Draft SEIS/EIR issued to the public and public agencies for review and comment in December 2015.

CODES, STANDARDS, AND GUIDELINES

The design of protection schemes for existing buildings must conform to the latest edition of the San Francisco Building Code.

See CHAPTER 6, Utilities, for requirements for the relocation or protection-in-place of utilities.

REFERENCES

Attewell, P.B., Yeates, J. and Selby, A.R. 1986. “Soil movements induced by Tunnelling.” Chapman and Hall, New York.

Bjerrum, I. 1963. “Allowable Settlement of Structures.” Proceedings of European Conference on Soil Mechanics and Foundation Engineering.” Weisbaden, Germany, Vol. 2: 35-137.

Boscardin, M. and Cording, E. 1989. “Building Response to Excavation Induced Settlements.” Journal of Geotechnical Engineering. ASCE. Vol. 115, No 1: 1-21.

Bracegirdle, A., Mair, R.J., Nyren, R.J. and Taylor, R.N. 1996. “A methodology for evaluating potential damage to cast iron pipes induced by tunneling.” Geotechnical Aspects of Underground Construction in Soft Ground, Mair & Taylor (eds.). Balkema, Rotterdam: 659-664.

Burland, J.B. Broms, B.B. and Demello V.F.B. 1977. “Behaviour of Foundations and Structures.” Proceedings of the 9th International Conference on Soil Mechanics and Foundation Engineering.

Cording, E.J., Long, J.L., Laefer, D., Ghahreman, B. (2010). “Assessment of Excavation-Induced Building Damage. Proceedings of the Earth Retention Conference 3 (2010), Seattle, WA. ASCE Library.

Mair, R.J., Williamson, M.G., (2014). “The Influence of Tunneling and Deep Excavation on Piled Foundations.” Keynote Lecture. Proceedings of the 8th International Conference on Geotechnical Aspects of Underground Construction in Soft Ground., 21-30, 2014.

Mair, R.J., Taylor, R.N. and Burland, J.B. 1996. "Prediction of ground movements and assessment of risk of building damage due to bored tunnelling." Geotechnical Aspects of Underground Construction in Soft Ground (eds R.J. Mair and R.N. Taylor), Balkema, Rotterdam: 713-718.

Peck, R. (1969). "Deep Excavations and Tunneling in Soft Ground," in Proceedings of the 7th International Conference on Soil Mechanics and Foundation Engineering, Mexico City, 4, 225–290.

Son, M., and Cording, E.J. (2005). "Estimation of Building Damage Due to Excavation-Induced Ground Movements." Journal of Geotechnical and Geoenvironmental Engineering. February 2005. pp. 162-177.

Wahls, H. E. 1981. "Tolerable Settlement of Buildings." Journal of the Geotechnical Engineering Division. ASCE. Vol. 107, No. GT11: 1489-1504.

11.1 Ground Movements/Settlement Estimates

Initial support systems must be designed to withstand the design loads and control the ground movements that could otherwise affect overlying buildings, utilities, and streets. The design must make use of proven construction techniques to control ground movement. Support systems for excavations must be selected, where possible, to minimize unsupported ground in the tunnel as much as practical.

11.1.1 Preliminary Evaluation

The method used for the preliminary evaluation of tunnel settlements must follow industry-accepted practice pioneered by Peck (Peck 1969) and updated by Mair, Taylor, and Burland (Mair et al. 1996). Although the work of Peck and Mair was developed for tunnel boring machine tunneling methods, the approach can be applied to sequential excavation methods within the context of a preliminary evaluation. For sequential excavations, the settlement curves resulting from each excavation stage will be superimposed, i.e., multiple settlement curves will be developed, and an enveloping settlement curve will be developed. Volume loss for each individual drift will be evaluated.

The maximum settlement and width of the settlement trough is a function of the volume of lost ground, the depth of the tunnel, and the geotechnical characteristics of the soils. The volume of the settlement trough must be assumed to be equal to the total volume of lost ground during tunneling, which is usually given as a percentage of the excavated area. Lost ground is defined as the volume of all ground movements occurring around a tunnel or each individual drift or sequence.

The designer is responsible for developing estimates of face loss along the DTX tunnel alignment to be used in the calculation of surface settlements. Surface settlement calculations must be reviewed by geotechnical engineer and approved by the Transbay Joint Powers Authority (TJPA).

Ground loss values used for analyses must reflect the excavation method and be based on historical data obtained from projects using similar methods in comparable soil and groundwater conditions.

Consolidation settlements, including horizontal and vertical, must be assessed and superimposed on the tunneling-induced settlements. Settlement contour plans along the full alignment must be prepared. Horizontal movements and strains resulting from tunneling must also be predicted.

11.1.2 Numerical Methods

Numerical methods, using finite element or finite difference techniques approved by the TJPA, must be used in detailed evaluations of ground movements and the potential impacts on existing buildings and adjacent facilities. The methods used for these evaluations must consider the excavation and support sequences being proposed and must include sensitivity analyses, as defined in section 11.2, to assist with the determination of construction approaches that can minimize potentially damaging ground movements.

Confirm the results of the numerical methods using comparisons with empirical methods. Differences between the two types of analyses must be explained to the satisfaction of the TJPA.

11.1.3 Impacts of Construction-Induced Deformations on Adjacent Structures

Studies must evaluate the potential impacts of construction-induced surface and subsurface deformations on adjacent structures. Use empirical methods to perform an initial screening, with the objective of identifying the most critical impacts. Additional detailed studies may be required, including soil-structure interaction analyses to properly evaluate the impacts on adjacent structures. The designer must evaluate the need for special studies and include a discussion of additional needs within the reports prepared during the initial study phase and submit to the TJPA for approval.

11.2 Assessment of Ground and Structure Movements

Temporary works, including support of excavation and tunnel initial support, must minimize ground movements associated with the excavation and construction of the tunnels and strictly limit the extent of underpinning and other protective works required beyond the limits of the excavations. The design of temporary works must make use of proven construction techniques and assume a high quality of workmanship during construction.

The influence of existing structures or facilities on excavation or tunneling and the corresponding influence of excavation or tunneling on existing infrastructure must be analyzed and evaluated from both a structural and geotechnical standpoint.

All existing structures that encroach on or are immediately next to the DTX alignment must be evaluated. All structures within the zone of influence, defined as the horizontal or vertical ground movement of 0.25 inch (1/4 inch) or greater, must be assessed for damage.

Determination of the 0.25-inch ground movement contour must consider overlapping zones, including, for example, where cut-and-cover excavations and tunnels are in close proximity or where dewatering and excavations may both be sources of ground movement. In addition to proximity to the alignment, the age, type, use, and construction of existing structures must be considered. Buildings that have been reconstructed, retrofitted, or renovated such that they have mixed foundations must be evaluated in detail, with consideration given to the nature of the building structure and the foundations.

The influence of excavation on existing structures must be evaluated, and design parameters for allowable settlement, differential settlement must be established for each affected structure. Damage risk assessments must be in accordance with the approach developed by E.J. Cording (Cording et al. 2010), or similar methods approved by the TJPA. See Chapter 9, section 9.6, Instrumentation and Monitoring, for instrumentation and monitoring requirements.

11.2.1 Cut-and-Cover Structures

The design parameters for allowable settlement, differential settlement, and rotation must be developed considering the existing infrastructure. The design parameters will be the subject of agreement between the TJPA and the owner of each infrastructure asset.

Impacts on existing infrastructure near cut-and-cover construction may be attributable to ground movements outside of the excavation as a result of:

- Installation of the excavation support walls
- Lateral movement of the excavation support walls during excavation
- Consolidation of compressible soil layers
- Grouting, piling, soil improvement, or similar measure required for the construction of works

Seepage analyses must be carried out for all excavations, and the potential for consolidation settlements, piping, blow-in, and heave must be assessed. Settlement contour plans associated with cut-and-cover excavations that include immediate and consolidation settlements must be prepared.

Soil-structure interaction analyses must be undertaken to demonstrate that the anticipated ground movements resulting from the proposed construction would result in allowable settlements, differential settlements, and rotations that are within the limits of the established design parameters for each structure considered.

Where ground movements will affect pile-supported structures, the effects of soil movements induced by excavation must be evaluated in a moment curvature space. Should the additional load imposed on the pile by the ground movements reduce the pile's capacity to carry its original design load (lateral and axial), the design must be revised to reduce the ground movements. The design must be documented in a report to the Geotechnical Engineer and TJPA. A secondary report must be prepared for the evaluation of Caltrans pile-supported structures.

To the maximum extent possible, the design of excavation support systems must limit ground movements to an extent that damage is repairable by redecoration (Cording et al. 2010). Where preliminary design indicates that the design parameters—allowable settlements, differential settlements, and rotations for existing structures—are exceeded, the design must be revised as necessary.

The following mitigations must be considered:

- Redefine the sequence of excavation and construction
- Increase the stiffness of the excavation support system through incorporation of the following:
  - Reduced spacing of bracing elements
  - Increased size of bracing elements
  - Thicker support walls or incorporation of wall stiffening elements such as 'T' panels
- Conduct ground improvement (i.e., grouting)
- Alternate method(s) approved by the TJPA

Where these and other appropriate mitigation measures are unsuccessful in reducing structure movements to within the limits of the agreed design parameters, underpinning or other protective works must be considered in accordance with section 11.3

11.2.2 Tunnel

Impacts on infrastructure near tunnel construction may be attributable to ground movements that occur as a result of the sequence of excavation and ground support. Design of the tunnel should avoid reliance on the following construction methods, where possible, and in accordance with the project's Final SEIS/EIR:

- Groundwater lowering by pumping
- Groundwater lowering by pervious temporary linings or support systems

Numerical methods, using finite element or finite difference techniques, must be used to evaluate ground movements and the potential impacts on existing buildings and adjacent facilities. These methods must consider the excavation and support sequences being proposed and include sensitivity analyses to determine construction approaches that can minimize potentially damaging ground movements.

For piles located within a 1:1 line extending upwards and outwards from the tunnel springline, soil-structure interaction must be used to evaluate ground movement and the potential for building damage.

11.3 Protective Works

Protective works are required for infrastructure within the zone of influence of the cut-and-cover structures and tunnel where predicted values for movement exceed the limits of parameters established in section 11.2 However, the implementation of protective works can cause deformations that may be as severe as the deformations that these measures are intended to mitigate, and this must be considered in the selection of protective works methods.

The designer must develop a toolbox of methods to be implemented for protective works. Protective works can comprise building strengthening, underpinning, and ground improvement or some combination of these methods, or any other appropriate methods. When determining the appropriate protection for an existing structure or utility, the designer must consider the sequence of construction and the effect of placement of protection on other phases of construction and vice-versa.

A summary assessment for every building, utility, or other structure or facility within the zone of influence must be prepared for TJPA acceptance. The summary assessment must include an estimate as well as a description, category of potential damage, and proposed mitigations, including a recommendation for the use of protective works and the nature of the proposed protective works.

For structures identified as historically significant in the Final SEIS/EIR for the Transbay Program or supplements to that document, damage must be limited to that which can be repaired by redecoration. No advance mitigation measures will be permitted without agreement from the relevant authority having jurisdiction and the TJPA.

The assessments must be documented in a Property Protection Study Report that includes a list of all structures within the zone of influence and their associated damage risk category, in accordance with Cording (Cording et al. 2010) or similar methodology. The Property Protection Study Report must include the results of the evaluation of damage to utilities (including joint rotation and pullout), and infrastructure within the influence zone.

CHAPTER 12 STRUCTURES

SCOPE

This chapter establishes the requirements for structures, including the following:

- Transbay Joint Powers Authority (TJPA)-owned facilities, including cut-and-cover structures, passenger stations, support of excavation, u-walls, earth-retaining structures, ventilation and egress structures, buildings, and miscellaneous structures
- Temporary structures and permanent facilities owned by others that are constructed or modified as part of the Downtown Rail Extension (DTX) project, including bridges, passenger stations, buildings, and miscellaneous structures

See the following chapters for criteria for other structure types:

- CHAPTER 11, Protection of Existing Infrastructure
- CHAPTER 13, Tunnels
- CHAPTER 18, Rail Systems

The design of structures built or modified as part of the DTX project, but owned by others, must meet the requirements of the agencies that have jurisdiction over said structures.

CODES, STANDARDS AND GUIDELINES

The design of TJPA-owned structures must conform to the latest edition of the following standards, codes, and guidelines unless otherwise specified in these criteria:

- American Association of State Highway and Transportation Officials Load and Resistance Factor Design Road Tunnel Design and Construction Guide Specifications (AASHTO LRFD Road Tunnel)
- American Concrete Institute (ACI) Manual of Concrete Practice, including:
  - ACI 201.2R, Guide to Durable Concrete
  - ACI 224R, Control of Cracking in Concrete Structures
  - ACI 301, Specifications for Structural Concrete
  - ACI 315R, Guide to Presenting Reinforcing Steel Design Details
  - ACI 318, Building Code Requirements for Structural Concrete and Commentary
  - ACI 365.1, Service-Life Prediction—State-of-the-Art Report
  - ACI 506.2, Specification for Shotcrete
  - ACI 506.5R, Guide for Specifying Underground Shotcrete
- American National Standards Institute/American Institute of Steel Construction – ANSI/AISC 360, Specification for Structural Steel Buildings
- American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering

- American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) standards:
  - ASCE/SEI 7, Minimum Design Loads and Associated Criteria for Buildings and Other Structures
  - ASCE/SEI 37, Design Loads on Structures during Construction
- ASTM International standards:
  - ASTM A36, Standard Specification for Carbon Structural Steel
  - ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - ASTM A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
  - ASTM A416, Standard Specification for Low-Relaxation, Seven-Wire, Steel Strand for Prestressed Concrete
  - ASTM A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
  - ASTM A706, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
  - ASTM A709, Standard Specification for Structural Steel for Bridges
  - ASTM A722, Standard Specification for High-Strength Steel Bars for Prestressed Concrete
  - ASTM A820, Standard Specification for Steel Fibers for Fiber-Reinforced Concrete
  - ASTM A1064, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
  - ASTM A1085, Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)
  - ASTM F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
  - ASTM F3125, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions
- California Building Code (CBC)
- California High-Speed Rail Authority (CHSRA), Design Criteria Manual (DCM)
- Caltrans (California Department of Transportation) Bridge Design Specifications (CBDS), which include Caltrans Amendments to the AASTHO LRFD Bridge Design Specifications
- Caltrans Seismic Design Criteria
- Caltrans Trenching and Shoring Manual
- City and County of San Francisco Municipal Transportation Agency (SFMTA) – Central Subway Design Criteria
- Federal Highway Administration Publication FHWA-NHI-I-10-034, Technical Manual for Design and Construction of Road Tunnels – Civil Elements, December 2009
- The Concrete Society, Technical Report No. 63: Guidance for the Design of Steel-Fiber-Reinforced Concrete, 2007
- National Fire Protection Association - NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems

- Peninsular Corridor Joint Powers Authority - Caltrain Engineering Standards, including
  - Caltrain Standards for Design and Maintenance of Structures
  - Caltrain Standards for Excavation Support Systems
- San Francisco Building Code (SFBC) which includes San Francisco Code Amendments (SF Amendments)

12.1 Materials

Structural materials used in the temporary and permanent construction for the DTX must meet the requirements listed in the following subsections.

12.1.1 Concrete

The minimum 28-day compressive strengths (f'_c) for concrete must be as shown in Table 12-1:

Table 12-1: Minimum 28-day Compressive Strength for Concrete

Type	Compressive Strength
Cast-in-place substructure concrete	4000 psi
Cast-in-place superstructure concrete	4500 psi
Shotcrete	4000 psi
Precast concrete	5000 psi
Prestressed concrete	5000 psi

The minimum compressive strength of concrete at the time of initial prestress must be 4000 psi.
The designer may specify higher compressive strengths for concrete where needed, if justified.

12.1.2 Concrete Reinforcing Steel

Reinforcing steel must conform to ASTM A706, minimum Grade 60, with the following allowances:

- Reinforcing steel for drainage junction structures and sign and signal foundations independent of cut-and-cover, permanent earth-retaining, and bridge structures must conform to ASTM A615, Grade 60.
- Reinforcing steel for concrete barriers must conform to ASTM A615, Grade 40 or 60.

Design and construction of uncoated seven-wire, stress-relieved or low-relaxation strand reinforcing steel must conform to ASTM A416.

Design and construction of uncoated high-strength reinforcing steel bar must conform to ASTM A722.

Steel fibers for fiber-reinforced concrete must conform to ASTM A820.

12.1.3 Structural Steel

All structural steel must conform to the requirements in the CBDS, be weldable, and have the following properties:

- Permanent construction must conform to ASTM A709, Grade 50.
- Temporary works construction must conform to ASTM A709, Grade 36 or Grade 50.

- Pipe temporary works must conform to ASTM A53, Grade B (Type E or S), with a minimum yield strength (f'_y) of 35 ksi or with ASTM A709 Grade 36 or 50.
- Hollow structural sections for permanent works must conform to ASTM A1085.

12.1.4 Structural Steel Connections

All structural steel must conform to the requirements in the CBDS and have the following properties:

- High-strength bolts must conform to ASTM F3125.
- Low-strength bolts must conform to ASTM A307.
- Anchor rods must conform to ASTM F1554.
- Welding must conform to applicable American Welding Society (AWS) standards.

12.1.5 Overhead Anchors

The use of adhesive anchors for overhead applications subject to sustained tension loads is prohibited.

12.1.6 Existing Materials

Determination of the mechanical properties and capacity of existing materials to be used for structure design must be consistent with applicable record documents related to the design and construction of the existing facility. Where records are not available or if the properties of the existing material require it, material sampling and laboratory testing must be employed.

12.1.7 Minimum Unit Weights

Use the minimum unit weights for materials shown in Table 12-2 to ensure the consistency of the DTX design. For materials not listed, see CBDS or CBC, as applicable.

Table 12-2: Materials Minimum Unit Weights

Materials	Required Minimum Unit Weight
Concrete	
plain	145 pcf
reinforced	150 pcf
Steel	490 pcf
Water and Groundwater	62.4 pcf
Compacted sand, gravel, earth	
saturated	130 pcf
buoyant	68 pcf
Compacted sand, gravel, earth (flotation case)	
saturated	120 pcf
buoyant	58 pcf
Pavement	150 pcf
Rock	150 pcf

Materials	Required Minimum Unit Weight
Brick masonry	120 pcf
Stone masonry	150 pcf
Gravel ballast, crushed stone	120 pcf
Rails and fasteners (no ties)	200 pounds per linear foot/track

pcf = pounds per cubic foot

12.1.8 Waterproofing

Underground structures must be designed to be completely waterproofed and must be approved by the TJPA. A waterproofing system must be installed between the initial support and final of all underground structures and between the temporary precast tunnel linings and cast-in-place final linings of bored tunnels. Waterproofing design must accommodate anticipated hydrostatic pressures. Waterproofing systems must include:

- Geotextile fabric
- Compartmentalized sheet membrane waterproofing, with provision for remedial grouting
- Waterstops at all construction joint locations
- Re-injectable grout hose within waterstops

Where reinforced concrete is to be placed against the waterproofing membrane, no damage to the exposed membrane surface that would permit seepage through the membrane is allowed. The design must include provisions for the repair of the waterproofing system as well as the collection and removal of water from underground structures in the event of leakage.

Do not use a waterproofing membrane with bentonite clay components.

12.1.9 Fire Resistance

All DTX structures must conform to the fire resistance requirements in the National Fire Protection Association (NFPA) 130 and the CBC. Fire resistance design must be approved by the authority having jurisdiction. See CHAPTER 15, Fire Life Safety.

12.2 Cut-and-Cover Structures

The design of cut-and-cover structures must conform to the requirements in AASHTO Load and Resistance Factor Design (LRFD) Tunnel and this section. Underground stations and ventilation and egress structures constructed using cut-and-cover methods must also conform to the requirements of the SFBC.

12.2.1 Loads and Forces

All cut-and-cover structures and associated components to be constructed or modified as part of the DTX project must be proportioned to withstand all applicable loads, forces, and combination of loads defined in AASHTO LRFD Road Tunnel and additional minimum loads in this subsection.

Permanent Loads

A: Dead Loads (DC). The dead load consists of the actual weight of the structure and the weight of all installations considered fixed, such as concrete track slab and safety walks. In stations and structures, the dead load also includes the weight of masonry partition walls and stairs and landings.

B: Superimposed Dead Loads (DW). The weights of suspended and affixed rail systems equipment, finishes, utility services, running rail and ties, and other system elements are considered removable and must be classified as superimposed dead load. In addition to the unit weights in Table 12-2, assume the following allowances in the design for superimposed dead load.

- 20 psf minimum for finishes on floor slabs and platforms
- 40 psf minimum for the weight of ceiling finishes and services below roof slabs and suspended slabs

In addition to the stated allowances, localized impacts on the cut-and-cover structures from unique mechanical and electrical equipment, such as elevators, escalators, and jet fans, must be considered in the design. The structures must be able to support the maximum reactions from any manufactured units.

Electrical equipment rooms, pump rooms, service rooms, storage space, and machinery rooms must be designed for a minimum uniform load of 250 psf, which must be increased if storage or machinery loads dictate. The loads for which such rooms are designed must be indicated on the structural drawings.

C: Earth Vertical Load (EV). Cut-and-cover structures must be designed for the actual depth of cover over the roof slab according to the proposed ground surface elevation and as recommended in the geotechnical reports and design memoranda.

D: Earth Horizontal Load (EH). Lateral earth pressures imposed by vertical soil loads on the cut-and-cover structures must be derived using the effective soil unit weight together with the appropriate strength parameters. The geotechnical engineer will establish the lateral earth pressures. Pressure diagrams will be developed and presented within the Geotechnical Interpretive Report (GIR) or included in specific design memoranda. One set of lateral earth pressure diagrams will be developed for the excavation support with due consideration given to the type of retaining system to be used, and another set for the permanent structures.

At the request of the geotechnical engineer, and as approved by the TJPA, numerical analyses may be performed, and equivalent lateral earth pressure diagrams resulting from these analyses, developed. When numerical analyses are performed, the load factor used for active pressure or apparent earth pressure must be used in the design. Numerical analyses also provide information, such as bending moments, shear forces, and earth pressures, that can be used by structural engineers and shoring designers to design both the shoring system and permanent structures.

E: Earth Surcharge Loads (ES). Underground structures must support lateral earth surcharge loads from adjacent buildings or other structures, including both existing structures and future developments next to the DTX alignment, as allowed under existing zoning and land use regulations or as defined in this chapter. Unsymmetric loading must be considered to produce the greatest effects for the structural element under consideration.

Existing Building Earth Surcharge. Cut-and-cover structures (temporary and permanent) must accommodate surcharge loading imposed by existing adjacent buildings when the horizontal distance from the building line to the nearest face of the structure is within the influence zone as defined in CHAPTER 11Protection of Existing Infrastructure.

Do not consider building surcharge loads where the adjacent structures are founded or permanently underpinned at a depth below the influence zone of the structure.

Existing structures must be considered individually, based on the outcomes of surveys of existing plans and field confirmation of the building configuration. Existing structure surcharge loads must be determined from as-built drawings. In the absence of as-built drawings, estimate the surcharge loads using structural observations and engineering judgement relative to building height, construction type, foundation type, and current SFBC requirements.

The designer must develop a report that details for each existing building the source of building information and the development of estimated building loads, including but not limited to dead and live loads and associated calculations. This existing building report must be submitted to TJPA for review.

Adjacent and Future Development Earth Surcharge. Where developments are planned or in progress, estimate the surcharge loads from the planning documents.

Where there is potential for future development directly over the DTX 's structure, including at all subsurface easements on privately owned portions of the right-of-way, use a surcharge estimated from the maximum height development allowed by zoning; the analysis must consider conditions of unloading during construction and reloading.

In the absence of defined loading, the following scenarios must be considered:

- Unloading:
  a. Excavation to a depth to the top of the cut-and-cover structure at center point. Excavation scenarios must consider full excavation above and adjacent to the structure and the following partial excavation scenarios:
     i. An excavation width equal to the zone of influence
     ii. Asymmetric excavation
     iii. Symmetric and asymmetric excavation adjacent to the structure to an excavation boundary equal to the zone of influence
  b. Excavation to a depth 40-feet below ground level adjacent to the structure, with the excavation boundary width equal to the zone of influence
- Reloading and surcharging:
  a. New construction represented by a vertical surcharge load of 1,000 psf plus the weight of the removed soil applied 45 feet above the structure centerline, applied for a width equal to the zone of influence
  b. New construction represented by a vertical surcharge load of 1,600 psf plus the weight of the removed soil applied at excavation invert level, applied outside of the zone of influence
  c. New construction represented by a vertical surcharge of 1,600 psf applied at ground surface level at all non-public right-of-way where future development may occur

Transit-Oriented Development Earth Surcharge Load. Cut-and-cover structures that will be supporting future transit-oriented development (TOD) must accommodate the dead load construction of buildings with a maximum of eleven above-grade stories over the entire cut-and-cover structure footprint. These cut-and-cover structures include the Southeast TOD cut-and-cover structure bounded by the limits of

Howard Street, Second Street, and Tehama Street, and the northeast TOD cut-and-cover structure bounded by Howard Street, Second Street, and the Transit Center.

F: Shrinkage (SH). Shrinkage and creep effects must be incorporated into the concrete design in accordance with AASHTO LRFD Road Tunnel and ACI 318, Building Code Requirements for Structural Concrete and Commentary.

Transient Loads

A: Live Loads (LL). Live loads consist of rail live loads, Caltrain and high-speed tracks, San Francisco Municipal Railway tracks, impact loads, roadway live loads, transit-oriented development live loads, and pedestrian area live loads.

Rail live loads. must be applied within cut-and-cover structures. Rail live loads must also be applied to the roof of cut-and-cover structures where the potential for future trackwork may exist.

Caltrain and High-speed Tracks. Assume that rail live loads within the limits of the Caltrain right-of-way are consistent with Cooper E-80 loading. Axle load, spacing, load distribution, and simultaneous loading on adjacent tracks and impact load must conform to AREMA Manual for Railway Engineering.

Arrange the Cooper E-80 loading in combinations to produce the most critical conditions for axial, bending, shearing, and torsional stresses, deflections, and stability.

The effects of impact load associated with live load must be considered in accordance with AREMA.

San Francisco Municipal Railway (Muni). The San Francisco Municipal Transportation Agency's Central Subway project crosses the DTX at the intersection of Fourth and Townsend streets. The two Muni tracks, running north/south in the center of Fourth Street, pass at-grade over the DTX underground bridging structure.

One Muni train consists of not more than two cars.

The distance between the Muni track centers is 14 feet 6 inches. A train on each track concurrently must be considered.

Figure 12.1 shows the legacy Muni light rail vehicle (LRV) for the Central Subway manufactured by AnsaldoBreda (model LRV2). Muni is in the process of replacing its legacy fleet with the Siemens S200 LRV. The physical characteristics of the legacy Muni LRV (AnsaldoBreda) as well as the Siemens S200 models are provided in Table 12-3.

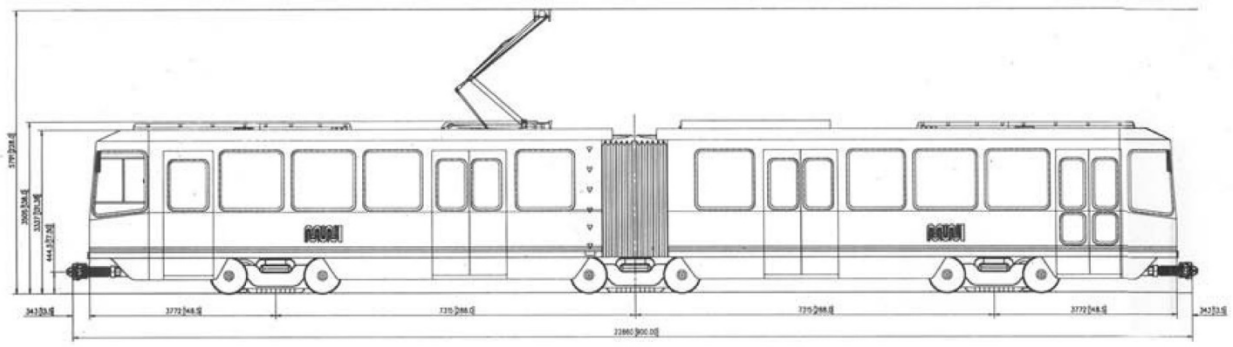

Figure 12.1: AnsaldoBreda Muni Light Rail Vehicle

Table 12-3: Muni LRV Models

Load Distribution Parameters	AnsaldoBreda LRV2	Siemens S200
Track Gauge	4 ft 8.5 in.	4 ft 8.5 in.
Length over coupler faces	75 ft	75 ft
Distance between trucks	24 ft	24 ft
Truck wheel base	6 ft 3 in. (approx.)	6 ft 3 in. (approx.)

Use an LRV crush load (AW3) weight of 110,000 pounds (AnsaldoBreda) in the DTX design; this includes the weight of the vehicle and passenger load. The weight is distributed as follows:

End trucks (each)	35% of LRV weight	38,500 pounds
Center truck	30% of LRV weight	33,000 pounds

The weight criteria of the Muni LRV provided by SFMTA Central Subway Design Criteria are as follows:

- AW0 – Empty car weight is 76,000 pounds
- AW1 – Fully-seated weight (62 passengers plus operator) is 85,700 pounds
- AW2 – Fully-seated load with moderate standee density (155 passengers plus operator) is 100,000 pounds
- AW3 – "Crush load" weight, Fully-seated load with maximum standee density (220 passengers plus operator) is 110,000 pounds

Distribute Muni live loads as follows:

- For fill height less than 2 feet: apply roadway live loads directly to the roof slab as concentrated loads.
- For fill height greater than 2 feet: distribute live loads through the fill over a square area, the sides of which are equal to 1.75 times the depth of fill. Where distribution areas overlap, distribute the total load uniformly over an area defined by the outside limits of the individual areas.

Impact Loads. The design of cut-and-cover underground structures supporting rail loading must consider the live load impact. Calculate the impact loading as a percentage of the live load based on the depth of fill over the underground structure as shown in Table 12-4:

Table 12-4: Impact Loading

Fill Depth	Impact
0 ft to 1.0 ft	30% of live load
1.0 ft. to 2.0 ft	20% of live load
2.0 ft to 3.0 ft	10% of live load
over 3.0 ft	0

The fill depth for all loading is measured from the proposed ground surface elevation to the top of the cut-and-cover structure.

Roadway Live Loads. The effect of live loading from roadway traffic must be considered in the design.

For cut-and-cover structures underneath City streets, the roadway live loads must conform to the CBDS.

The distribution of roadway live loads through backfill and the calculation of impact factors is as described for the distribution of rail live loads. See Chapter 12, subsection 12.2.1, Transient Loads.

Transit-Oriented Development Live Loads. For areas where the cut-and-cover structure will be supporting a future transit-oriented development, the minimum live loads are as defined in ASCE/SEI 7 and SFBC, as follows:

- For Strength Combinations: Full Building Live Load x 0.5
- For Safety Evaluation Earthquake Combinations: Full Building Live Load x 0.25
- For all other load combinations: Full Building Live Load

The aforementioned conditions apply where transit-oriented development is planned.

Pedestrian Area Live Loads. Station platforms, stairways, pedestrian ramps, mezzanines, and other pedestrian areas must be designed for a uniform load of 150 psf. Stair treads for a uniform load of 100 psf or a concentrated load of 300 pounds.

Emergency walkways must be designed for a uniform live load of 100 psf on the walkway area or a concentrated load of 1,000 pounds. The concentrated load must be applied at any point on the walkway and distributed over an area of 2 feet by 2 feet.

Sidewalks must be designed to support a minimum uniformly distributed load of 250 psf pedestrian load and the live load of AASHTO standard modified design truck S20-44, not applied concurrently. The loading must be patterned to produce the maximum load effects.

B: Live Load Surcharge (LS).

Minimum Live Load Surcharge. For future traffic loads, an area surcharge applied at the ground surface both over and next to underground structures must be used to simulate possible roadway and sidewalk live loads. This surcharge must also simulate conditions during future construction activities next to the underground structures. Such construction may result in permanent loads or temporary loads from construction equipment, the stockpiling of construction materials, or the deposition of excavated earth.

An area surcharge must be applied at the ground surface both over and next to underground structures. The vertical surcharge must be considered as a static uniform load applied at the ground surface as follows, where x is the vertical distance from the top of the tunnel roof to the ground surface, in feet:

600 psf for $x < 5$ $\quad 600 - 40(x - 5)$ psf for $5 \leq x \leq 20$ $\quad 0$ for $x > 20$

The above surcharge must not be applied when:

- an alternative traffic loading is specified, or
- a specific, applicable building surcharge is applied

Live load lateral surcharge pressures imposed on the cut-and-cover structures must be considered from the following sources as appropriate. The surcharge loads and limits of their application in the design will be established by the geotechnical engineer and presented within the GIR or in specific design memoranda.

Transit-oriented Development and Existing Buildings. Where earth surcharge from existing buildings and transit-oriented development (see section 12.2.1, subsection E) are considered, the live load surcharge must also be considered. The minimum live load surcharge pressures are as defined in ASCE/SEI 7 and SFBC, as follows:

- For Strength Combinations: Full Building Live Load x 0.5
- For SEE Combinations: Full Building Live Load x 0.25
- For all other load combinations: Full Building Live Load

The designer must document the development of the estimated live load in each existing building in a report. All existing building reports must be submitted to TJPA for review. See Chapter 12, section 12.2.1, subsection E**E: Earth Surcharge Loads (ES)**, for further description of the existing building reports.

Rail. Derive and apply surcharge loads for cut-and-cover structures within the limits of the Caltrain right-of-way in accordance with the Caltrain Engineering Standards for Excavation Support Systems.

Roadway. Calculate and apply roadway surcharge loads in accordance with the CBDS.

Construction/Minimum. Construction/minimum surcharge loads that reflect potential conditions during construction and anticipated future conditions will be established by the geotechnical engineer and presented within the GIR or in specific design memoranda.

C: Centrifugal Force (CE). Centrifugal force must be considered in the design of DTX cut and-cover-structures on curved sections of the alignment. Calculate and apply centrifugal force in accordance with AREMA.

D: Longitudinal Force (BR) . Apply longitudinal force for Caltrain and high-speed trains in accordance with AREMA.

Longitudinal force resulting from Muni LRV acceleration and deceleration must be considered as follows:

- 16% of Muni train loading for accelerating trains
- 21% of Muni train loading for decelerating trains

Apply the longitudinal force to the rails and supporting structure as a uniformly distributed load over the length of the train in a horizontal plane acting at the top of rail elevation.

E: Air Pressure Loads (AP): Air pressure loads and piston effects of trains entering and leaving tunnels must be considered, in conformance with AASHTO LRFD Road Tunnel.

A minimum 0.3 psi must be applied inward or outward, whichever causes the more significant effects on all walls, partition walls, and glazing panels.

F: Water Loads (WA, WAf, WAt). The effects of hydrostatic pressure must be considered whenever the presence of groundwater is indicated. Hydrostatic pressure is computed at 62.4 psf per foot of depth below the design groundwater level for the condition being assessed.

The California-licensed geotechnical engineer will establish and present the groundwater levels to be used in the design within the GIR or in specific design memoranda. The TJPA will review and approve the groundwater levels to be used in design. Design ground water levels must include tidal influences and the

effect of sea level rise over the service life of the structure. Water pressures will reflect the likely fluctuations of groundwater levels anticipated during the life of the structure, based on historical data available at the time of design, data from monitoring wells, and in accordance with recommendations of the geotechnical engineer in consultation with hydrogeologists/geologists. Analyses will be undertaken using the most critical water pressure that is expected for the analysis, which may correspond to either the lowest or highest water pressure anticipated depending on the type of analysis being used.

Long-term variations in the groundwater level and the possibility of future significant changes in groundwater elevation will be considered in establishing the design groundwater levels.

The completed permanent structure must be designed for hydrostatic pressures arising from the following conditions:

- Normal high water
- Normal low water
- 100-year flood level

G: Collision Loads (CT). Collision loads arising from the derailment of a train must be considered, in conformance with AREMA Manual for Railway Engineering.

Vehicle collisions loads must be considered in accordance with the CBDS for above grade section only.

H: Derailment Loads (DR). In the event of derailment, damage to structures must be minimal. Progressive collapse and global instability of the structure are not permitted.

A single line of rail live wheel loads equal to the design load per rail including impact must be applied at an eccentricity of 5 feet from the centerline of track, but no further than the offset to structural elements that are designed to resist collision loads.

I: Nosing and Hunting Effects (NE). Nosing and hunting effects must be considered. This must be accounted for as a lateral force of 22 kips applied at the top of rail, perpendicular to the track centerline at the most unfavorable position.

NE must be considered simultaneously with CE for the most unfavorable loading condition.

J: Seismic (EQ) . See CHAPTER 10, Seismic Design, for seismic design requirements.

Load Factors and Combinations

Collision loads, derailment loads, and nosing and hunting effects must be added to the AASHTO load combinations and load factors shown in AASHTO LRFD Road Tunnel Table 3.4.1, Load Combinations and Load Factors, as follows:

- Add “CT” collision loads and “DR” derailment loads to the second to the last column of Table 3.4.1 under “SS.”
- Add “NE” nosing and hunting effects to second column of Table 3.4.1 under “PL.”
- For the Service T-IA load combination, change the load factor for “WA” and “W_t” to 1.25.

Buoyancy

Provisions must be made for cut-and-cover structures to resist hydrostatic uplift forces. Calculate the buoyancy force as the total hydrostatic uplift pressure applicable at the underside of the invert slab, multiplied by the projected horizontal area of the base slab. Use the unit weight of water in Table 12-2 in the calculation of the buoyancy force.

Design water levels must include effects of sea level rise over the design life of the structure.

The buoyancy force will be resisted by the dead weight of the structure and by backfill and groundwater within a vertical plane extending upwards from the external limits of the structure roof slab. The depth of backfill calculated to resist uplift must not include the top 2 feet of cover. Use the unit weight of compacted material backfill in Table 12-2 in the calculation of the resisting force.

Do not use the following in the calculation of the force resisting hydrostatic uplift:

- Effects of skin friction on the walls of the structure
- Any live load internal or external to the structure
- Superimposed dead loads—electrical and mechanical equipment/plant loads
- Building dead load above the structure

During construction, buoyancy must be mitigated by dewatering or depressurization within the support of excavation system to ensure that a minimum factor of safety of 1.10 is maintained at all stages of construction.

Where the structure itself is unable to economically meet the prescribed factors of safety, the designer may propose alternative means of meeting the factor of safety. These may include providing a positive connection between the support of excavation system and the cut-and-cover structure, in which case, the effects of skin friction on the support of excavation below the level of excavation may be considered. Allowable skin friction values less than those for compression will be determined by the geotechnical engineer. Deviations from these criteria must be approved by the TJPA through a design variance request. See Chapter 1, section 1.8, Variances and Changes to Design Criteria.

12.2.2 Serviceability Requirements

The following design and detailing requirements must be met to help ensure the durability of the DTX cut-and-cover structures in achieving their desired service life.

Exposure Conditions

The minimum distance from concrete surface to the outermost surface of steel reinforcement (or encased steel beams) must conform to the CBDS.

Crack Width/Control

For serviceability limit states, reinforcement must be designed to limit crack widths less than or equal to 0.008 inches at a 2-inch depth of cover.

Crack widths in temporary construction elements do not need to be checked.

The minimum area of longitudinal (temperature and shrinkage) reinforcement will be 0.002 times the gross concrete area for slabs and 0.0025 times the gross concrete area for walls. This temperature and shrinkage reinforcement area need not exceed 0.79 in^2/ft placed at each face regardless of the thickness of the wall or slab.

Deflection

All structural elements must conform to deflection limits under service loading conditions in accordance with AREMA Manual for Railway Engineering and AASHTO LRFD Road Tunnel.

Detailing

Dimensioning of bar lengths, laps, bar bends, etc., must conform to the requirements of AASTHO LRFD Road Tunnel and the CBDS.

Detailing of reinforcement must conform to ACI 315R and satisfy durability requirements given in ACI 201.2R.

In addition to requirements stated in this subsection, the following specific requirements must be adopted:

- Spacing of reinforcement must not be greater than 6 inches in either direction.
- In concrete members designed to accommodate axial tension forces, avoid lap splices in tension members; however, when required, laps on adjacent bars must be staggered such that the minimum distance between the ends of adjacent lapped bars or connectors will be the largest of 30 bar diameters or 1.75 feet.
- Welded butt splices are not permitted.
- Avoid the use of shear reinforcement in two-way structures, such as slabs and walls, except when required for plastic hinges.
- Shear stirrup reinforcement in beams will form a closed loop to maintain confinement of the section.
- Shear reinforcement in walls and slabs will have alternating 135° and 90° hooks.
- Walls and slabs must have a minimum of two layers of reinforcement, one at each face of wall or slab.

Joints

A: Interface Joints. Interface joints must be provided at the interface between different structure types such as tunnel to cut-and-cover structure and locations of cross section changes.

Interface joints must be designed and constructed so that the joints are fully watertight over the range of predicted movements in all directions. Design details must accommodate differential settlements, thermal expansion and contraction, fire resistance, and seismic compatibility. See CHAPTER 10, Seismic Design, for additional requirements.

Interface joints must include a preformed filler, a joint sealant, and a centerbulb-type waterstop made of plastic or rubber.

Each interface joint must include a re-injectable grouting system.

Joints must be watertight with the full range of calculated in-service movements taken into account in the design.

B: Construction Joints. Construction joints must be able to transmit all the forces that may occur under any design condition.

- Transverse joints in interior walls, invert slabs, and emergency egress corridors of the tunnel structure must be detailed as construction joints.
- Reinforcement must be continuous through the construction joint.
- Each construction joint must contain an intentionally roughened surface to a 0.25-inch amplitude.
- Construction joints must be watertight. Waterstops must be used in all construction joints in exterior walls, floors, and roofs.
- The Engineer of Record must approve location of all construction joints.

12.3 Temporary Excavation Support

The criteria in this section govern the design of temporary excavation support systems constructed as part of the DTX project. See section 12.4 for the criteria for excavation support systems that will be part of a permanent structure.

The design of excavation support structures must conform to the criteria in subsections 12.3.1, Planning for Excavation Support and Underpinning, through 12.3.6, Bracing to Wall Connections. In addition, excavation support system design must conform to the specific requirements of the CBDS, AREMA, and the Caltrain Standards for Excavation Support Systems in the Caltrain right-of-way. The design of excavation support structures within City-owned and Caltrans rights-of-way must conform to the requirements of the Caltrans Trenching and Shoring Manual.

12.3.1 Planning for Excavation Support and Underpinning

The Engineer-of-Record, in coordination with the TJPA, must investigate existing structures that are to remain over, or next to, the construction sites of DTX facilities. Existing structures must be protected and permanently supported and underpinned, as necessary.

The types of buildings and structures, that require support and underpinning include

- buildings and structures extending over the DTX structures to such an extent that they must be temporarily supported during construction and permanently underpinned.
- buildings and structures immediately next to the DTX structures that require temporary support during construction.
- buildings and structures that may be affected by groundwater lowering. In certain areas, the uncontrolled lowering of the groundwater for DTX construction may cause the settlement of buildings within the influence zone.

12.3.2 Design Requirements

Analyses of excavation support systems must consider all conditions and loadings that might occur during the various stages of construction, including sequential dewatering, excavation, installation of bracing elements, construction of the permanent structure, and removal of bracing. The excavation support system design must meet the requirements for strength, deformation, and stability at all stages of excavation and construction. Submit details of proposed software and models to the TJPA for approval prior to undertaking any design.

The analyses must use estimates of the actual earth, water, and surcharge pressures on the wall and consider the effect of construction-induced ground movements on adjacent structures. The design of earth support systems must also consider the effects of the relocation and temporary support of utilities.

Where lateral loading conditions on opposite sides of an excavation are not equal and struts are used, the wall and bracing system must be designed for the larger loading conditions, and the entire temporary support system must be analyzed for the resulting asymmetric loading.

A distinction must be made between drained and undrained strengths for short-term (construction) and long-term loading conditions. Support walls used in the permanent structural load resisting system must resist the loads from at-rest earth pressure in the final ground condition if there is not enough wall displacement to mobilize active and passive pressures; the permanent structural system design must consider any residual stresses resulting from the temporary condition.

The geotechnical engineer will derive the earth pressures for the excavation support system design using the effective unit weights of soil layers together with the appropriate strength parameters. The geotechnical engineer will develop limiting wall movements that are based on the adjacent structure or foundation type. Pressure diagrams and limiting wall movements will be developed and presented within the GIR or included in specific design memoranda.

Shoring support must extend at least 10 feet below the base of the excavation or into a competent soil or rock layer, whichever is deeper, unless the Engineer-of-Record shows that vertical and horizontal support requirements can be developed at less than 10 feet below the excavation depth. The minimum depth of shoring below the excavation depth must be 2 feet.

The weight of shoring walls may be used to resist the effects of buoyancy only if the shoring walls are structurally connected to the remainder of the permanent structure, subject to meeting the design requirements of permanent underground structures. Deviations from these criteria must be approved by the TJPA through a design variance request. See Chapter 1, section 1.8, Variances and Changes to Design Criteria.

Underpinning walls or piers that support structures and form a portion of the excavation support system must extend to a minimum depth identified in the GIR or included in specific design memoranda.

Underpinning

Methods used to protect or underpin existing structures must account for the site-specific soil and groundwater conditions and include bracing systems.

Bracing systems must be tight for the effectiveness of underpinning and for the protection of wall support. The Engineer of Record must indicate requirements for the installation and removal of the temporary bracing systems that relate to the design of underpinning and protection walls, such as the levels of bracing tiers, the maximum distances of excavation below an installed brace, and the amount of preloading.

Other geotechnical considerations outlined in CHAPTER 9, Geotechnical Requirements. must also be considered.

12.3.3 Wall Bracing and Tie-backs

Bracing must provide support to the wall system, resisting all excavation dead and live loadings and bearing either directly on the wall or on a horizontal wale. Bracing must be of adequate spacing and stiffness to minimize support wall deflections, deformations and inward movements.

The depth of placement and preload on the first level of struts must minimize deformations of the system, avoid deformations detrimental to adjacent utilities, and be consistent with optimizing the design of the shoring.

The uppermost level of bracing must be installed as close to the ground surface as practical. Vertical spacing may be increased when struts are removed, provided that the invert slab has achieved at least 60 percent of its 28-day design strength and the support system is designed for such increased spacing.

Temporary bracing must account for the effects of temperature, as temperature variations in cut-and cover excavations can cause substantial load increases on the bracing systems. The design temperature variation must conform to AASHTO LRFD Road Tunnel.

The use of tiebacks will be limited by right-of-way constraints and will not be used in the Caltrain right-of-way at the Fourth and King Street Station. However, the designer must investigate the use of tiebacks in the approach to the Transit Center under Second Street.

12.3.4 Loads

Applicable minimum loads and forces must conform to section 12.3.5. Seismic forces for excavation support systems are defined in CHAPTER 10, except as modified in this section.

For structures to be shored for 5 years or less, wind loading and design must conform to ASCE/SEI 37.

For structures to be shored for over five years, wind loading and design must conform to applicable codes for permanent structures.

Excavation support must limit movements to a level coordinated with the necessary adjacent property and utility protection measures. The Engineer-of-Record must demonstrate that the anticipated wall movements are coordinated with the proposed property and utility protection measures.

Soil load redistribution caused by temporary excavation support or existing foundation systems must be analyzed.

12.3.5 Load Factors and Combinations

In selecting critical loading combinations, consideration will be given to appropriate combinations of maximum and minimum vertical loads with maximum and minimum horizontal loads and to unsymmetrical loads. See Chapter 12, subsection 12.2.1, Loads and Forces/Load Factors and Combinations.

The design of temporary structures constructed using concrete must conform to ACI 318 and AASTHO LRFD Road Tunnel. Loads caused by construction equipment and the design of other temporary structures must conform to ASCE/SEI 37.

12.3.6 Bracing to Wall Connections

Filler plates, shims, or grout must be used to obtain a tight fit between bracing elements and a wale or wall. Upon completion of the wall bracing and support system, no further driving of wall piles will be permitted.

Connections between struts, wales, and the wall system must accommodate a minimum tensile and shearing load equal to the greater of the actual tensile/shear forces as derived from analysis or 10 percent of the design compressive strut load.

12.4 Permanent Earth-retaining Structures

The criteria in this section govern the design of permanent earth-retaining structures constructed or modified as part of the DTX project. Permanent earth-retaining structures include u-walls, retaining walls, and abutments and wing walls for bridges.

The design of earth-retaining structures must conform to the criteria specified herein and the specific requirements of the CBDS, AREMA, and the Caltrain Standards for Design and Maintenance of Structures.

12.4.1 Types

Earth-retaining structure type selection must meet the project's functional and durability requirements and be consistent with the requirements of the Caltrain Standards for Design and Maintenance of Structures.

12.4.2 Loads

Earth-retaining structures must be proportioned to resist the applicable loads as described in subsection 12.2.1, Loads and Forces. Seismic forces must conform to the requirements in CHAPTER 10SEISMIC DESIGN.

12.4.3 Load Factors and Combinations

The load factors and load combinations for earth-retaining structures must conform to the CBDS.

12.4.4 Buoyancy

Adhere to the requirements for buoyancy in subsection Chapter 12, subsection Buoyancy.

12.4.5 Serviceability Requirements

Adhere to the requirements for serviceability in subsection 12.2.2, Serviceability Requirements, unless indicated otherwise in section 12.4, Permanent Earth-retaining Structures.

12.4.6 Deflections

The maximum permissible top of wall deflections for cantilevered structures and mid-height deflections for structures laterally supported at the top will be established by the geotechnical engineer and submitted for TJPA approval. Tolerable wall movements will be developed and presented within the GIR or included in specific design memoranda.

12.4.7 Stability

Base Pressure

Earth-retaining structures must be proportioned such that the base pressure does not exceed the allowable soil bearing capacity. To minimize differential settlement and outward tilting of walls, proportion the walls so that the pressure under the footing is as uniform as practical under long-term loading.

Where the structure cannot be economically proportioned to meet the allowable soil bearing capacity or where the base pressure produces excessive differential settlement, the structures must be founded on piles.

Stability – Overturning

A minimum factor of safety of 2.0 against overturning under permanent loads must be maintained. For structures resting on rock, a minimum factor of safety of 1.5 against overturning under permanent loads must be maintained.

Stability – Sliding

A minimum factor of safety of 1.5 against sliding under permanent loads must be maintained.

Ignore the uppermost 3 feet of finished grade earth at front (toe) of the wall in the calculation of sliding resistance.

Global Soil Mass Stability

The overall stability of earth-retaining structures must be considered in the design. A minimum factor of safety of 1.5 under permanent loads must be maintained.

12.5 Bridges

The criteria in this section govern the design of bridges that are constructed or modified as part of the DTX project. These criteria also apply to structures whose failure will affect DTX facilities or operations.

Required modifications to the I-280 Sixth Street off-ramp and the I-80 structure on Second Street are the scope of this section.

Roadway and highway bridge design must also meet the requirements of the CBDS.

Railway bridge design must also meet the requirements of AREMA, as modified by the Caltrain Standards for Design and Maintenance of Structures.

12.5.1 Loads

Loads for bridge design must be calculated and applied as specified in this subsection and must also meet the requirements of the CBDS for roadway and highway bridges and AREMA standards, as modified by Caltrain Standards for Design and Maintenance of Structures for railway bridges.

Differential Settlement

Differential settlements of existing bridges affected by DTX construction must be limited to the values agreed with the respective bridge owners. The settlement limits will be established by the geotechnical engineer and presented within the GIR or included in specific design memoranda.

Collision Loads

Bridge piers or substructure elements located within 25 feet or less from the centerline of a railroad track must be of heavy construction as defined in AREMA or must be protected by a reinforced concrete crash wall, in accordance with AREMA. The impact must not cause the instability or failure of major structure elements.

The use of derailment containment devices must be considered as mitigation for derailment impact forces.

12.5.2 Load Factors and Combinations

Load factors and combinations of loads for roadway and highway bridges and railway bridges must conform to the CBDS and AREMA standards, respectively, as modified by Caltrain Standards for Design and Maintenance of Structures.

12.5.3 Buoyancy

The effects of buoyancy must be considered in the design of substructures.

Adhere to the safety factors against flotation in subsection, Chapter 12, subsection Loads and ForcesBuoyancy, for new construction. For modifications to existing structures, maintain the existing factors of safety against hydrostatic uplift.

12.6 Buildings

The criteria in this section govern the design of new buildings and modification of existing buildings. Buildings include above-ground station facilities, ventilation and egress structures, and maintenance and storage buildings.

The design of buildings must meet the requirements of the SFBC. Modifications to the Caltrain station at Fourth 4th and King streets and 4th and King Railyards must conform to the Caltrain Design Criteria and Caltrain Standards for Design and Maintenance of Structures.

12.6.1 Loads

Loads for building design must meet the requirements of the SFBC.

12.6.2 Load Factors and Combinations

Load factors and combinations of loads for buildings must conform to the SFBC.

12.6.3 Design Considerations

Building structures must accommodate the installation, maintenance, and replacement of heavy electrical and mechanical equipment.

12.6.4 Detailing

Dimensioning of bar lengths, laps, bar bends, etc., must conform to the requirements of SFBC and ACI 318.

Detailing of reinforcement must conform to ACI 315R and satisfy durability requirements given in ACI 201.2R.

12.7 Miscellaneous Structures

The criteria in this section govern the design of miscellaneous structures that are not specifically referenced in prior sections of this chapter. These may include visual walls, sound walls, barrier walls, signs, and other similar structures.

The design of miscellaneous structures must conform to the SFBC. Highway and roadway structures must conform to the requirements of the CBDS. Structures within the Caltrain right-of-way must conform to the requirements of AREMA, as modified by the Caltrain Standards for Design and Maintenance of Structures.

The calculation of loads, load factors, and combinations of loads must conform to the designated code.

12.8 Foundations

Foundations for structures within the Caltrain right-of-way must conform the requirements of AREMA, as modified by the Caltrain Standards for Design and Maintenance of Structures. Foundations for highway and roadway structures must conform the requirements of the CBDS. Building foundation design must conform to the requirements of the SFBC.

Permissible values for load resistance capacity, movement capacity, stability analyses, and settlement for foundations will be established by the geotechnical engineer and presented within the GIR or included in specific design memoranda.

12.9 Watertightness and Leakage Mitigation

Underground structure design must limit water ingress. Any visible water leakage must be prevented.

Materials used in preventing or stemming water ingress must not compromise the fire safety or the durability of the structures in which they are used. If passive fire protection or architectural finishes are required inside the tunnel, seepage drainage must be designed for and provided behind such systems.

Allowable daily infiltration rates and criteria must conform to Table 12.3. All infiltration values must be measured at the source of the leak.

Table 12-5: Allowable daily infiltration rates

Water Tightness Class	Dampness Characteristics	Definition	Infiltration (gal/sf)	Location
1	Absolutely dry	No damp areas visible on the surface	0.00025	All room surfaces containing equipment. Zones used to house electrical, systems and communications equipment.
2	Substantially dry	Occasional damp patches which do not discolor blotting paper, detectable on the surface	0.0012	All public area surfaces of underground stations. Underground structures used by public.
3	Capillary dampness	Occasional damp patches on the surface, but no movement or water apparent to the eye or drops of water	0.0025	All emergency egress and ventilation structure surfaces
4	Small amounts of dripping or moving water	Occasional drops of water or water moving along surface	0.005	Guideway structure surfaces not covered above

Limit water ingress at any individual locations to less than 0.025 gallons/ft^2/day and no more than 1 drip per minute at any location.

Do not permit water drips over the trainway or emergency walkway surfaces or where they have the potential to cause damage to equipment; to cause the malfunctioning of any electrical power, signaling, lighting, control, or communication equipment; or to compromise electrical clearances.

Do not permit the ponding of water on emergency walkway surfaces.

Embedded electrical boards, electrical conduits, and other similar elements must be completely waterproofed and watertight.

All joints—construction joints, expansion joints, and interface joints between structure types—must be fully watertight over the range of anticipated movements.

12.10 Drainage

Regardless of the waterproofing system used and permissible leakage criteria, drainage systems must be provided in underground structures and must collect condensation, infiltration, spilled water, and other flows over the service life of the structures. Tunnel drainage must conform to the criteria in CHAPTER 16MECHANICAL SYSTEMS.

The linear underground structure profiles must be designed to maintain positive drainage.

Any seepage in guideway structures must be carried away by the track drainage.

All rooms and spaces in underground structures must have the means to collect and drain water from inside the structure to the track drainage, station, or ventilation and emergency egress structure drainage system, as appropriate.

Interface and expansion joints must have the means to collect and channel any infiltration to an appropriate drainage system.

CHAPTER 13 TUNNELS

SCOPE

This chapter establishes the requirements for the design of the Downtown Rail Extension (DTX) tunnel, including mined tunnels constructed using sequential excavation method (SEM), bored tunnels excavated by tunnel boring machine (TBM), and initial support and final lining systems for tunnels. This chapter also includes the codes, standards, guidelines, and criteria governing the design of initial support and final lining systems for tunnels.

"Initial support" refers to the support installed in conjunction with tunnel excavation operations to maintain stability and safety of the excavation and to minimize ground movements.

"Final lining" refers to the lining installed independent of and following tunneling operations to provide permanent support of the tunnel, satisfy watertightness requirements, and provide a surface finish that achieves acceptable performance in terms of the owner's requirements.

See CHAPTER 7, Guideway Geometrics, for the required clearances for tunnel sections. Tunnels inclusive of required or specified tolerances must be designed to achieve these clearances and accommodate all rail and tunnel operating systems as well as specified tolerances.

See CHAPTER 9, Geotechnical Requirements, for geotechnical guidance for use in the design of mined tunnels.

See CHAPTER 12, Structures, for additional load and infiltration criteria for tunnels as defined herein.

CODES, STANDARDS AND GUIDELINES

Tunnel design for the DTX must conform to the latest edition of the following standards, codes and guidelines unless otherwise specified in these criteria:

- American Association of State Highway and Transportation Officials Load and Resistance Factor Design Road Tunnel Design and Construction Guide Specifications (AASHTO LRFD Road Tunnel)
- American Concrete Institute (ACI) Manual of Concrete Practice, including:
  - ACI 224R, Control of Cracking in Concrete Structures
  - ACI 301, Specifications for Concrete Construction
  - ACI 318, Building Code Requirements for Structural Concrete and Commentary
  - ACI 365.1, Service-Life Prediction—State-of-the-Art Report
  - ACI 506.2, Specification for Guide to Shotcrete and associated committee reports
  - ACI 506.5R, Guide for Specifying Underground Shotcrete
  - ACI 533.5R, Guide for Precast Concrete Tunnel Segments
  - ACI 544.7R, Report on Design and Construction of Fiber Reinforced Precast Concrete Tunnel Segments
- American Railway Engineering and Maintenance of Way Association (AREMA), Manual for Railway Engineering

- American Society of Civil Engineers/Structural Engineering Institute – ASCE/SEI 7, Minimum Design Loads for Buildings and Other Structures
- ASTM International standards:
  - ASTM A36, Standard Specification for Carbon Structural Steel
  - ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - ASTM A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
  - ASTM A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
  - ASTM A706, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
  - ASTM A709, Standard Specification for Structural Steel for Bridges
  - ASTM A820, Standard Specification for Steel Fibers for Fiber-Reinforced Concrete
  - ASTM A1064, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
  - ASTM A1085, Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)
  - ASTM C920, Standard Specification for Elastomeric Joint Sealants
  - ASTM C1116, Standard Specification for Fiber-Reinforced Concrete
  - ASTM C1550, Standard Test Method for Flexural Toughness of Fiber Reinforced Concrete (Using Centrally Loaded Round Panel)
  - ASTM C1609, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
  - ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
  - ASTM D7205, Standard Test Method for Tensile Properties of Fiber Reinforced Polymer Matrix Composite Bars
- California Occupational Safety and Health Administration (Cal/OSHA) Tunnel Safety Orders, California Department of Industrial Relations Division of Occupational Safety and Health, Title 8, Tunnel Safety Orders
- Caltrans (California Department of Transportation) Bridge Design Specifications (CBDS)
- National Fire Protection Association - NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems
- U.S. Army Corps of Engineers (USACE). 1997. *Tunnels and Shafts in Rock.* Engineering and Design Manual, EM 1110-2-2901. 30 May 1997.

REFERENCES

Appropriate references, including the following, may also be used in support of the analysis and design of mined tunnels.

Barton, N. and R. Lien and J. Lunde. 1974. "Engineering classification of rock masses for the design of tunnel supports." *Rock Mechanics* 6(4): 189-236.

Bieniawski, Z.T. (1989). Engineering Rock Mass Classifications, New York: Wiley.

The Concrete Society. 2007. Technical Report No. 63: Guidance for the Design of Steel-Fiber-Reinforced Concrete.

Construction Industry Research and Information Association (CIRIA). 2020. *The Management of Advanced Numerical Modelling in Geotechnical Engineering* (C791).

Deere, D. and R. Peck, J. Monsees, and B. Schmidt. 1969. "Design of Tunnel Liners and Support Systems." Prepared for the U.S. Department of Transportation.

Deutscher Ausschuss für unterirdisches Bauen e. V. (DAUB). German Tunnelling Committee (ITA-AITES). 2013. *Recommendations for the Design, Production and Installation of Segmental Rings*.

German Committee for Structural Concrete. 2015. DAfStb Guideline: Steel Fiber Reinforced Concrete.

Heuer, R.E. 1974. "Important Ground Parameters in Soft Ground Tunneling." In *Subsurface Exploration for Underground Excavation and Heavy Construction.* New York: American Society of Civil Engineers.

Hoek, E. and T. Brown. 1980. *Underground Excavations in Rock*. London: Institution of Mining and Metallurgy.

Institution of Civil Engineers (ICE). 1996. Sprayed Concrete Linings (NATM) for Tunnels in Soft Ground.

International Federation for Structural Concrete (fib). 2006. "Model Code for Service Life Design." Bulletin No. 34.

International Tunneling Association (ITA). 2020. *Permanent Sprayed Concrete Linings*, Report No. 24.

John, Max, and Bruno Mattle. 2003. Shotcrete lining design: Factors of influence. In Proceedings of the Rapid Excavation and Tunneling Conference. 726–734.

Muir-Wood, A. 1975. "The circular tunnel in elastic ground." *Géotechnique* 25, No. 1: 115-127.

PAS 8810 Tunnel Design-Design of Concrete Segmental Linings-Code of Practice, British Tunneling Society.

Peck, R.B. 1969. "Deep Excavations and Tunnelling in Soft Ground." *Proceedings of the 7th International Conference on Soil Mechanics and Foundation Engineering.* Mexico City. International Society for Soil Mechanics and Geotechnical Engineering.

Proctor, R. and K. Terzaghi, T. White,. 1988. Rock Tunneling with Steel Supports.

Rabcewicz, L.V. and J. Golser. 1973. "Principles of Dimensioning the Supporting System for the New Austrian Tunnelling Method." *Water Power*: 88-93.

13.1 Materials

Structural materials used for initial support and final lining of tunnel excavations must conform to the requirements of CHAPTER 12, Structures, section 11.1.

13.1.1 Cast in Place Concrete

The structural behavior of tunnel components constructed from concrete must be investigated for each stage of construction, including handling, transportation, and erection, and during the service life of the structure that they are part of. Structures must be proportioned to satisfy the requirements at the strength, extreme event, service, and fatigue limit states.

Use the following minimum 28-day concrete compressive strength, f_c', for structural elements:

- Cast-in-place concrete: 4,000 psi
- Precast concrete tunnel lining: 6,500 psi

Structural concrete must conform to ACI 301. Do not use lightweight concrete for load bearing structural concrete. Lightweight concrete may be used for non-structural applications (e.g., walkways, non-structural finishes). Recycled materials may be used for non-structural applications.

13.1.2 Shotcrete

Shotcrete compressive strength must conform to the requirements for cast-in-place concrete. See subsection 13.1.1, Cast in Place Concrete.

Shotcrete must conform to ACI 506.2 and ACI 506.5R.

Shotcrete materials must conform to the most recent applicable ASTM standards.
Steel or synthetic fibers may be used in initial support shotcrete to improve flexural strength, ductility, and toughness. Energy absorption capacity and residual flexural strength for fiber-reinforced shotcrete must be specified to suit the intended application and demonstrated with preconstruction testing in conformance with ASTM C1550 or ASTM C1609.

13.1.3 Reinforcement

Reinforcing steel for concrete reinforcement must be deformed bars conforming to ASTM A706.

Welded wire fabric must conform to ASTM A1064.

Steel fiber reinforcing must conform to ASTM A820. Steel and synthetic fibers must conform to ASTM C1116.

Polypropylene microfibers must be provided in the final linings of tunnels to help mitigate the incidence of explosive concrete spalling during a design fire event.

Reinforcement used for presupport of SEM excavations or to stabilize and strengthen the rock mass and provide supplemental initial support must meet the requirements in Chapter 12, subsection 12.1.5, Overhead Anchors.

Structural Steel Piping For Pipe Canopy

Structural steel pipe must conform to ASTM A53.

Steel Spiles

Pipe spiles must conform to ASTM A53; presupport must have a minimum yield strength of 35 ksi.

Bar spiles must conform to ASTM A615, with a minimum yield strength of 60 ksi.

Rock Bolts

Rock bolts must conform to ASTM A615, with a minimum yield strength (f'_y) of 60 ksi. However, the use of Grade 150 rock bolts is not permitted because of their brittle failure characteristics.

Fiberglass Dowels

Fiberglass dowels must have a minimum tensile strength of 70 ksi, conforming to the requirements of ASTM D7205, Standard Test Method for Tensile Properties of Fiber Reinforced Polymer Matrix Composite Bars.

13.1.4 Structural Steel for Initial Support

Structural steel elements used in the design of the initial support for SEM tunnels must have the properties described as follows:

Structural Steel Ribs. Structural steel ribs must conform to ASTM A36 Grade 36, or ASTM A572 or equivalent, A709, Grade 36 or Grade 50.

Lattice girders. Primary bar reinforcements must have a minimum yield strength of 70 ksi, conforming to ASTM A615. Steel plate for connecting elements must conform to ASTM A36.

13.1.5 Waterproofing

Mined tunnels must be completely waterproofed. A waterproofing system must be installed between the initial support and final lining of all mined tunnels and between the temporary precast tunnel linings and cast-in-place final linings of bored tunnels. Waterproofing material requirements are defined in Chapter 12, subsection 12.1.8, Waterproofing.

13.1.6 Precast Tunnel Lining Gaskets and Other Materials

Precast tunnel lining segments must include perimeter gaskets conforming with ASTM C920 and ASTM D412 to prevent waterflow through joints.

Gasket materials must withstand sustained exposure to any aggressive environment present in the ground or groundwater. The gasket material must withstand chemical attack and biological degradation such that the gasket functions properly over its service life. Hydrophilic seals and other types of gaskets can be used as secondary seals or in conjunction with the primary gaskets. If hydrophilic gaskets are used as secondary seals, long-term performance must be confirmed.

Gaskets must resist the anticipated hydrostatic pressures including fluctuations in water level through compression of the gasket for its service life, under conditions of maximum joint gap and gasket offset with an appropriate factor of safety, as approved by the geotechnical engineer. At a minimum, gaskets must be designed for double the maximum hydrostatic pressure on the tunnel lining to account for long-term performance of the gasket. The long-term durability and deterioration of the performance of the gasket due to creep and stress-relief must also be considered in the design.

Precast tunnel lining segments must be connected across both their radial and circumferential joints. For temporary linings, bolted connections must be used in radial and circumferential joints. For final linings, bolted connections must be used in radial joints, and dowels must be used in circumferential joints.

13.2 Loads, Load Factors, and Load Combinations

The design of initial support and final linings must consider loading conditions described in this section; loads, load factors, and load combinations must conform to Chapter 12, Structures, and AASHTO LRFD Road Tunnel.

Loadings imposed on the mined tunnel by the ground surrounding the tunnel and applicable surface surcharge loadings (i.e., loads induced by adjacent building foundations, street-level motor vehicle and rail traffic, and stockpiles of materials and equipment for construction) must accord with the results of the geotechnical investigation program and be consistent with the tunnel geometry and assumed construction methods.

13.2.1 Dead Loads

Dead loads and applicable allowances for superimposed dead loads—weights of elements affixed to the final lining, such as the overhead contact system (OCS), communications and electrical equipment, standpipes, etc., as defined in Chapter 12, section 0, Permanent Loads, must be accommodated in the mined tunnel design.

13.2.2 Live Loads

Design live loads consist of any non-permanent loads placed on or in the tunnel, including live loads that are due to rail and roadway traffic within and above the tunnel and pedestrian loads. Live load intensity including impact factors must be calculated and applied to conform to the criteria in Chapter 12, subsection B: Live Load Surcharge (LS).

13.2.3 Ground Loads

Use the following to develop ground loads in the design:

- Preliminary ground loads may be determined using accepted empirical methods commonly used to classify ground conditions to estimate ground loads and support requirements.
- Where the cover above the tunnel is less than 1.5 times the excavated span of the tunnel, the initial support must be designed for a ground load equal to the full overburden pressure, unless detailed numerical analyses are conducted to determine the loading more accurately.
- Initial load on tunnels in rock with cover greater than 1.5 times the excavated span must be designed for a rock load that considers arching. Soft ground tunnels may also consider arching, if appropriate, for temporary loading and must be designed for the full overburden pressure.
- Long-term load on tunnels in rock with cover greater than 1.5 times the excavated span must be designed for a rock load that considers arching. The design must also consider the weight of unstable rock blocks and wedges daylighted by the tunnel excavation. These blocks/wedges must act as point loads on the final lining and be applied in eccentric locations to produce conditions of maximum stress on the lining. Soft ground tunnels may only consider arching if appropriate for granular soils. Long-term loading on tunnels in cohesive soils must be based on full overburden.
- For watertight initial support system, groundwater pressure must be considered; otherwise, the pressure relief of the initial liner is required.
- Ground loads for final linings must include full hydrostatic groundwater pressure. No reduction in hydrostatic pressures is permitted, whether or not a pressure relief system is installed. Design groundwater pressures must conform to the groundwater levels as indicated in CHAPTER 12, subsection 0F, Water Loads.
- For tunnels, ground-structure interaction modeling must be used. Models must consider long-term behaviors and potential creep of the soil formations. Models must include loads imposed as a result of localized ground improvement such as TBM break-in/break-out and intervention locations.
- Groundwater loads applied must be the actual hydrostatic pressure on the tunnel, as determined by the ground water elevation or water surface elevation.
- Tunnel lining design must consider temporary conditions during construction, including dewatering, in-service conditions, and the 100-year flood inclusive of sea level rise caused by global warming.

13.2.4 Surcharge

Surcharge loads from existing buildings above tunnels must be considered in the design in conformance to the requirements in CHAPTER 12: Structures, subsection 0.E, Earth Surcharge Loads . Appropriate surcharge loads will be determined by the geotechnical engineer.

13.2.5 Thermal

Linings must be designed for thermal loads resulting in thermal expansion (T_e) and contraction (T_c) with temperature variations as defined in CHAPTER 12: Structures, subsection 12.4.5 Serviceability Requirements.

Additionally, the final lining system must be designed for a thermal gradient of 20 degrees Fahrenheit between the inside and the outside surface of the lining.

13.2.6 Shrinkage

The effects of shrinkage, creep, and early thermal cracking must be considered in the design of the final lining system, as defined in CHAPTER 12, subsection 12.4.5, Serviceability Requirements.

13.2.7 Collision Loads

Collision loads arising from the derailment of a train must be considered in the design of the mined tunnel, as described in CHAPTER 12, subsection 0.G, Collision Loads.

13.2.8 Extreme Events

Extreme event loads must be considered separately and must not be combined with other extreme loads.

Seismic Performance

Seismic performance of tunnels must be evaluated in accordance with Chapter 10, Seismic Design. The final lining system of the tunnel must have sufficient ductility and strength to withstand the ground deformations imposed on the tunnel by ground shaking.

Fire

Tunnel final linings and other structural elements essential to the stability of the tunnel must meet the construction requirements of the National Fire Protection Association (NFPA) 130.

The structural capacity of the lining must be confirmed during a fire event. The heat transfer to the structural elements from the design fire event must be derived from numerical analysis, including computational fluid dynamic modeling of the fire growth and the temperature increase and rate of gain of temperature increase of the tunnel lining. The analysis must include the tunnel lining and any other structural elements essential for tunnel stability, without the consideration of any mechanical fire-suppressing systems. Proposed methods of analysis must be approved by the Transbay Joint Powers Authority (TJPA). See CHAPTER 15, Fire-Life Safety, for a definition of the “design fire.”

The design fire must not result in the collapse of structural members. The performance of the tunnel lining and internal structure after the design fire event must be verified, considering any loss of section comprising spalled materials or material whose properties are diminished by exposure to high temperature. The tunnel lining must be capable of supporting in-service loads until it is repaired.

Alternatively, the tunnel lining and other structural elements may be passively protected from exposure to heat by sacrificial layers, protective coatings, or a protective screening. Protective measures must provide protection against the heat released by the design fire for a minimum of two hours with a maximum temperature at the surface of the protected element of 482 degrees Fahrenheit. All proposed protective measures must be accepted by the TJPA.

Flood

The effects of tsunami, flood water, and sea level rise must be accounted for in the design over the service life of the project. Tsunami and flood water surface elevation levels must be determined from historical data or modeling.

Blast

Tunnel security requirements must conform to the project's Threat and Vulnerability Assessment.

13.2.9 Construction Loads

Construction loads are dependent on construction methodology, construction sequence, and procedures. These may result in conditions that are more severe than the permanent loading conditions. Mined and bored tunnels must be designed to resist the load effects generated during construction.

Examples of construction loads include those defined in AASHTO LRFD Road Tunnel and the following:

- Crane and other equipment loading.
- Loads imposed by construction vehicles operating inside the tunnel.
- Data Retrieval.
- Loads arising from imperfect erection of bored tunnel lining rings. Ovalization must be determined based upon proposed segment ring configuration but must not be less than 0.25 percent of the tunnel lining radius.
- Loads induced by the installation or removal of ground improvement, and the driving of adjacent adits or excavations.

Construction loads must be applied with appropriate dynamic load factors. All temporary conditions must be assessed before installation of internal structures, including walkways, etc., that may have a relieving effect.

13.2.10 Load Factors and Combinations

Loads must be applied with load factors and in such combinations as defined in AASHTO LRFD Road Tunnel as a minimum. The designer is responsible for ensuring that all potential conditions and variations of stress on the lining are adequately represented in the design and must evaluate if there are other load combinations that must be addressed.

13.3 Buoyancy

The effects of buoyancy must be considered in the design of mined tunnels. Adequate resistance to flotation and buoyancy must be provided at each excavation and construction stage based on the groundwater level recommendations in the Geotechnical Interpretive Report (GIR).

Resistance to uplift must consist of the dead weight of the structure, overburden, and backfill within a vertical plane extending upward from the external limits of the excavation. Do not consider shear strength and friction of overburden. Do not use the elements listed in CHAPTER 12, subsection 0, Buoyancy, in the calculation of the resisting force.

Minimum factors of safety for construction and in the permanent condition must conform to Chapter 12, subsection 0, Buoyancy.

13.4 Analysis of Tunnel Structures

Tunnel lining design must incorporate Load and Resistance Factor Design in accordance with AASHTO LFRD Road Tunnel. The design of tunnel linings must account for performance requirements. These include service life; proposed use; ground and groundwater conditions, including flood water levels and buoyancy; ground and groundwater chemistry; and extreme events, including seismic and fire. Tunnel design must account for the impact of the tunnel on existing infrastructure and the impact of such infrastructure on the tunnel lining for both the short-term (during construction) and permanent conditions. Tunnel design must account for the sequence of construction and for future developments.

13.4.1 Methods of Analysis

State-of-the-art numerical modeling techniques comprising finite element or finite difference models and simulation procedures must be applied. Proposed software must be fully validated for its intended use. All analyses must be carried out in an auditable manner, in accordance with the Construction Industry Research and Information Association's guidance (CIRIA 2020) or similar approach acceptable to the TJPA.

The numerical simulations must be applicable to and reflect the work and construction sequence proposed. Analysis must take into account the in-situ stress conditions within the ground and short- and long-term soil-structure interaction characteristics of the ground and the tunnel lining.

A range of ground strength parameters must be considered; these include average and conservative parameters, overburden conditions, and excavation states. Soil strength and stiffness parameters used in models must reflect local ground conditions. The design must address changes in the groundwater table and maximum flood water elevation to account for maximum and minimum foreseeable groundwater pressures. Sensitivity analyses must be undertaken to account for variations in ground properties, tolerances, and loading conditions.

Numerical modeling results must be verified for reasonableness using alternative analysis methods—hand calculation, use of different software. The alternative analysis methods may be supported by comparison of the design output with data from comparable projects—in terms of geology and groundwater conditions, tunnel cross section, excavation sequence, etc.

13.4.2 Critical Sections Analysis

All critical sections for the analysis and design of tunnel linings must be selected on the basis of parameters that include tunnel geometry, alignment and profile, geological conditions, groundwater table, and proximity to existing infrastructure. Critical sections for bored and mined tunnels must be considered separately. Critical sections selected for analysis must include at a minimum:

- Locations of minimum and maximum ground cover
- Locations of maximum and minimum groundwater elevation
- Locations where mixed face soil conditions (both from natural ground and improved ground) are anticipated

- Locations where existing adjacent or overlying infrastructure is within the zone of influence
- Locations where adjacent structures are planned next to the tunnel alignment resulting in unloading conditions or out-of-balance load conditions
- Locations of eccentric loadings arising from future junctions or mined excavations
- Locations where the tunnel is within one tunnel diameter of deep foundations
- Locations where ground improvement measures are employed; such analysis must consider conditions where ground improvements are fully intact and where ground improvements have subsequently been removed or have fully degraded to native soil conditions
- Locations of interventions ahead of the TBM cutterhead for bored tunnels

Use appropriate modeling to determine the appropriate degree of ground relaxation. The modeling of bored tunnels must also consider that different face pressures may be employed for different amounts of cover and water levels, as well as during interventions.

Critical sections at tunnel interfaces with other structures or other types of tunnels must be considered separately. Use 3D ground-structure interaction modeling to assess intersections and analyze them based on the intersection geometry and the specific loading and geotechnical conditions at such locations. Determine the magnitudes of differential displacements between the different structure types and design appropriate interface joints as needed.

Tunnel lining modeling and design must consider the presence of internal structures under static and seismic loading conditions. The lining design must accommodate the transfer of all loads to and from internal structures.

13.5 Mined Tunnel Lining

Mined tunnels comprise temporary support elements—presupport and initial support, a waterproofing membrane, and a final lining. The analysis and design of initial support and final linings must conform to the requirements of Section 13.4, Analysis of Tunnel Structures.

13.5.1 Initial Support

The initial support system must support the actual ground loads shortly after excavation to provide a stable opening. The design of the initial support system including presupport must account for anticipated ground deformations and ensure that adequate clearance is maintained for installation of the final lining.

Presupport may comprise pipe canopy, pipe or bar spiles, rock bolts and anchors, face dowels, and other ground reinforcement elements. Initial support must include fiber-reinforced shotcrete supplemented with welded wire mesh, bar reinforcement, lattice girders or steel ribs, as necessary.

Initial support must be designed for application as close to the face as practical to limit loosening and enhance the arching characteristics of the ground, both to protect construction personnel and control ground movements.

The spacing of lattice girders or steel ribs must not exceed the designed length of advance, to assist with maintaining the cross-sectional tunnel geometry within specified tolerances.

Rock mass classification systems must be used to characterize ground conditions and assess general initial support system requirements. The rock mass must be classified on the basis of available geotechnical data in conformance with Terzaghi's rock condition categories, the Rock Mass Rating system, and Q-system (USACE 1997; Proctor et al. 1988; Hoek and Brown 1980; and Barton et al. 1974). Ground conditions for tunnels in soil (or soft ground) must be classified in conformance with procedures in the technical reports, "Important Ground Parameters in Soft Ground Tunneling" (Heuer 1974) and "Design of Tunnel Liners and Support Systems" (Deere et al. 1969).

The initial support system must be designed to support the ground above the opening and limit ground movements to acceptable levels (in terms of minimizing potential impacts on facilities above and next to the tunnel), taking into account the ground-lining interaction that occurs in the ground surrounding the tunnel excavation. The extent of the interaction must be directly dependent upon the excavation and support installation sequence and timing.

The design of the initial support must consider the following:

- Ground conditions, including stratigraphy, soil and rock types, groundwater conditions, strength, in situ stress-strain characteristics, and Poisson's ratio
- Material properties of the support elements, including the strength and stiffness (modulus) of each element
- Ground-lining interaction, including the deformation properties of the ground and lining system and the impacts of any adjacent construction or ground treatment

Define a robust construction sequence detailing excavation and support measures required at each intermediate excavation stage to achieve the final tunnel geometry in the anticipated ground conditions.
At a minimum, the excavation and support sequence analysis and design must address the following:

- Standup time of excavated face, length of advance and speed of ring closure
- Need for face support, presupport, or ground improvement measures
- Ensure stability and control of ground movements at all stages of tunnel excavation
- Geotechnical hazards, including impacts of variation of ground conditions and groundwater
- Impacts on adjacent infrastructure and construction
- Drainage
- Deformations/alert levels/trigger levels and corresponding required safety action

The initial support must be designed for sufficient longevity to provide stability of the excavations until the final lining has been installed. The design must define a systematic process for installing support measures, including time of installation and time when support becomes effective. The design must coordinate the initial support shotcrete rate of strength gain with the excavation sequence and durations. The effect of all support measures, with the exception of presupport elements, must be included in all stages of the analysis.

Initial support elements must conform to the same code and regulatory requirements that apply to the final lining and must be designed to accommodate all applicable loads and load combinations. Do not apply

extreme load conditions to initial support elements except for seismic, as defined in Chapter CHAPTER 10Seismic Design. Calculations must take full account of all tolerances.

13.5.2 Analysis

Methods for analyzing initial support must be capable of representing loads and deformations in accordance with the geologic and construction conditions and accurately accounting for the ground-lining interaction.

The excavation and support sequence will affect the behavior of the surrounding ground and possibly the ground surface. When designing the excavation and support sequences and initial support, consider the anticipated deformations and ground movements associated with such construction must be considered.

The design and construction methodology for mined tunnel initial support must address the following:

- Ground conditions:
- Strength and physical ground characteristics
- In situ stress conditions
- Standup time of excavated face
- Deformation properties
- Groundwater conditions and permeability
- Criteria for ground treatment

Construction parameters:

- Size, layout, and sequence of excavation stages
- Need for presupport, face support, or ground treatment measures
- Length of advance
- Tunnel crown and side wall support
- Speed of ring closure
- Requirements for building protection and ground treatment.
  See CHAPTER 11, Protection of Existing Infrastructure
- Drainage
- Waterproofing between initial support and final lining
- Deformations/alert levels/trigger levels and corresponding required safety action

Initial support design analyses must conform to the general design procedures developed by Rabcewicz and Golser (1973).

The ground mass behavior must be analyzed by varying the different rock mass parameters in a range of possible or expected values (parametric study). Each step of the sequence must be analyzed, with consideration given to the expected time between each step and consequent changes, for example, the change in shotcrete properties during curing.

The result of the computations must address:

- the stresses, strains, and deformations in the ground mass

- stresses or sectional forces and deformations of the initial support
- the ground loads on the support/outer lining calculated for the state of equilibrium

The analyses must be used for initial sizing of the initial support, subject to modification based on observations during construction. Selected safety factors must be commensurate with the nature of the work.

The results must be analyzed and must undergo a critical assessment to indicate the stability of the rock mass-support/initial support system. Sensitivity analyses, as required by CHAPTER 11, Protection of Existing Infrastructure, section 11.2must be used to define supplemental support measures or toolbox items to be used in conjunction with the initial support.

13.5.3 Final Lining

The final lining must provide a smooth surface that conforms to the operational, structural, and fire-life safety criteria in CHAPTER 2, Owner's Requirements; CHAPTER 12, Structures; and CHAPTER 15, Fire-Life Safety, respectively.

The final lining must be constructed from cast-in-place concrete or shotcrete. Final lining shotcrete will be subject to the same durability, design, and construction requirements as cast-in-place concrete. Final linings must be bar steel-reinforced or a combination of bar steel-reinforced and fiber-reinforced. Final linings using solely fiber-reinforced concrete are not permitted. Do not use fiber-reinforcement as primary reinforcement for tension-controlled structural members.

Final lining design must consider space and mounting requirements for equipment, utilities, alcoves, and emergency access and egress provisions.

Final linings must withstand the loads and combinations of loads in Chapter 12, section 0, subsection Load Factors and Combinations, using design codes and minimum materials requirements provided in Chapter 12, section 12.1, Materials. In addition to the requirements of Chapter 12, section 12.3, Temporary Excavation Support, final linings must consider a condition whereby the ground load is taken by the initial support, but the groundwater load is acting upon the final lining.

The final lining must not be installed until movement of the initial support has ceased, as defined by the designer.

13.5.4 Load Sharing

Load sharing between the initial support and the final lining is not permitted.

13.6 Bored Tunnel Lining Design

Bored tunnel linings may be used as initial support or as the final lining for bored tunnels. Bored tunnel linings comprise a segmental, gasketed, precast concrete tunnel lining connected across segment joints using a combination of bolts and dowels.

Bored tunnel linings must provide a durable structural support for water, soil, and other loads either until the tunnel final lining is constructed or to allow safe operation of the transit system for the service life indicated for final linings.

Precast concrete tunnel lining analysis and design must conform to the requirements of subsections 12.1through 12.10Load conditions for temporary precast concrete tunnel linings must conform to the requirements for initial support for mined tunnels; see subsection 13.5.1.

13.6.1 General Requirements

Precast concrete tunnel linings must be constructed of bar steel-reinforced concrete or a combination of bar steel and steel fiber-reinforced concrete. Precast concrete tunnel linings using only steel fiber-reinforced concrete must conform to ACI 544.7R and will only be accepted by the TJPA with demonstration of satisfactory seismic performance. Precast concrete tunnel linings used as initial support may be constructed using bar steel-reinforced concrete, steel fiber-reinforced concrete, structural synthetic fiber, or a combination of these.

Precast concrete tunnel linings must be designed to resist the effects resulting from the loads and load combinations specified in subsection 0.

Determine the configuration of the lining rings, individual segments and details of joints and connections to suit ground and groundwater conditions, handling loads, erection and TBM thrust loadings, methods and sequences of construction, tail void grouting pressures, and all functions in the completed tunnel. The design must address the following:

- Ring configuration, including tapered rings to fit the alignment vertical and horizontal curvature, to correct line and grade during construction and attain the required degree of water tightness of the tunnel. Cruciform joints are not permitted.
- Do not use spacers between segments or rings for negotiating curves. Joint packing may be used for stress redistribution or plane correction.
- Annular space between the ground and the lining must be filled with cementitious grout through the tail shield of the TBM.
- Connection details and other components, including circle (circumferential) joint connectors, cross (radial) joint connectors, demolding, handling, stacking, transportation and installation, holes, niches, recesses and fixtures for other system components, allowances for tolerances in segment production and in building the rings, and water tightness of gaskets.
- Drilling locators (such as small indentations) or other means for the attachment of the temporary and permanent tunnel services must be provided.
- Segmental concrete linings do not require contraction joints.

Special rings may be used at bored tunnel opening locations and may incorporate removable panels or other connection details within the ring to facilitate the controlled removal of segments to form openings. Special lining segments must accommodate the resulting load transfer and stresses from the removal of multiple segments while maintaining stability and watertightness.

13.6.2 Lining Stiffness

The effective moment of inertia of the tunnel lining must be used in the analysis of lining stiffness. This may be calculated using Equation 13.1 (Muir-Wood 1975), which must be modified to account for tunnel diameter and increased number of lining segments:

Equation 13.1. Effective Moment of Inertia

$$I_e = I_i + I_g(4/n)^2$$

Where:

I_e is effective moment of inertia, in inches^4
I_j = movement of inertia of the joint (in^4)
I_g = gross moment of inertia of the lining section (in^4)
n = number of joints in the lining ring

13.6.3 Segment Joint Design

Joints must resist resultant effects from the loads and load combinations specified. The design of segment joints for bearing and bursting effects must be based on the actual contact surface area available, considering the contact area lost to chamfers, packing, and gaskets used to seal the joints.

Joint design must conform to ACI 533.5R and PAS 8810.

Connecting devices across circumferential and radial joints between segmental lining rings and between segments within a ring must not provide structural moment capacity or flexural continuity. They must accommodate rotational flexibility of the segment joints while maintaining gasket closure. The pull-out capacity of connecting devices must be checked for erection and permanent loading conditions.

13.6.4 Construction Deviations

Precast concrete tunnel linings must be designed for the load effects and stresses resulting from deviations, load eccentricity, and offsets during construction. Load effects and overstresses must be calculated based on proposed construction tolerances.

13.6.5 Analysis

Finite element or finite difference analyses must be used to design the final lining. These analyses must be checked against an alternative simplified analysis method to verify that the results of the finite element analyses are within the expected range. Any significant differences between the finite element analyses and corresponding simplified analyses must be submitted to the TJPA for acceptance.

Specific analysis must be performed where there are large variations in the ground modulus over short distances.

13.7 Shaft Design

Shafts for ventilation or emergency egress constructed using SEM must be designed using the applicable criteria specified in this chapter. Lateral earth pressures, groundwater pressures, and surcharges used

to estimate ground loads must be based on recommendations provided by the Geotechnical Engineer of Record.

Shaft excavation support systems must be compatible with shaft excavation methods, and their design must consider the effects of breaking out into an adit or crossover cavern from the shaft excavation.

13.8 Serviceability Requirements

The design must conform to durability requirements provided in subsection 13.8.1, Durability, to help ensure that the mined tunnel structures achieve the desired service life. The requirements in this section and sections 13.9 and 13.10 must also be met.

13.8.1 Durability

Assess the durability of reinforced concrete structures and their associated metal components, if used, with regard to the following: materials, additives, concrete strength, fabrication and curing techniques, cover to reinforcement, climate parameters, concrete diffusion coefficient, concrete permeability, surface chloride concentration (loading rates) level, and threshold value to initiate steel corrosion, which must demonstrate how the proposed design intends to fulfill the durability and service life requirements. The analysis must include structural components including gaskets, bolts, dowels, and other associated inserts used in precast concrete tunnel lining design.

Final lining design must account for the potential effects of material deterioration, corrosion, corrosive characteristics of the soils and groundwater, leakage, stray currents, natural and man-made extreme events, and other potentially deleterious environmental factors on each of the material components composing the structure, and for load effects resulting from the construction process. The service life must be presented in a Durability Report, which must consider all final lining elements. The Durability Report must contain a service life prediction, in accordance with ACI 365.1, and probabilistic durability analysis, in accordance with fib Bulletin 34 – Model Code for Service Life Design.

13.8.2 Crack Control

Analyses must demonstrate that final lining reinforcement is sufficient to ensure against excessive cracking by limiting crack widths to less than the following:

- Mined tunnels
  Conform to the recommendations in section 13.5
- Bored tunnel segmental lining
  Design for crack control by distribution of reinforcement must conform to AASHTO LRFD Road Tunnel, with an exposure factor corresponding to a maximum crack width of 0.004 inches.

13.8.3 Minimum Reinforcement

The minimum area of temperature and shrinkage reinforcement for tunnels and underground structures must be calculated in accordance with AASHTO LFRD Road Tunnel.

Reinforcing bar spacing must not exceed the lesser of 12 inches or a distance equal to 1.5 times the lining thickness. Reinforcement must be continuous and evenly distributed and must be placed in two curtains, one at each surface.

13.8.4 Structure Joints

Interface Joints

Interface joints must be provided at the interface between different structure types, such as tunnel to cut-and-cover structure, tunnel to adit, or adit to shaft.

Joints must be designed and constructed so that the joints are fully watertight over the range of predicted movements in all directions. Design details must accommodate differential settlements, thermal expansion and contraction, fire resistance, and seismic compatibility. See CHAPTER 10, Seismic Design, for additional requirements.

Interface joints must be designed to accommodate all relative movements in the longitudinal, transverse, and vertical directions. Relative joint movements must be determined by numerical modeling or other suitable analytical methods with appropriate consideration of the effects of soil-structure interaction. The Engineer of Record must consider other loads, such as settlement, spatial variation of the ground motion, and fault displacement that may influence joint movements. A minimum factor of safety of 2.0 must be applied to the maximum calculated displacement demand to determine the necessary joint movement capacity.

Each interface joint must include a re-injectable grouting system.

Construction Joints

Construction joints must be designed to transmit all the forces that may occur under any design condition.

Transverse joints in interior walls, invert slabs, and emergency egress corridors of the tunnel structure must be detailed as construction joints.

Reinforcement must be continuous through the construction joint.

Each construction joint must contain an intentionally roughened surface to a 0.25-inch amplitude. Construction joints in the final lining must be watertight.

Waterstops must be provided in all external construction joints.

13.9 Watertightness and Leakage Mitigation

Groundwater inflows into mined tunnels during the construction phase must be minimized through the use of relatively impervious shotcrete linings.

Estimate the leakage using analytical methods that take into consideration the effects of the lining, geologic conditions, groundwater levels, and hydraulic conductivity of the deposits, as determined by the geotechnical investigations.

The effects of tunnel construction on the groundwater regime must be analyzed for impacts to adjacent buildings and facilities. Similar methods must be used to estimate groundwater flows into permanent drainage systems installed in tunnels.

Completed tunnels must be designed to limit water ingress. Groundwater infiltration into completed mined tunnels must be controlled to within limits defined herein by a waterproofing system applied between the initial support and the final lining. The final lining must be designed to withstand the pressures associated with design groundwater levels, with no contribution from the initial support.

Groundwater infiltration into completed bored tunnels must be controlled to within limits defined herein by the use of gaskets mounted to the perimeter of tunnel lining segments in conformance with the requirement in section 13.6

Visible leakage is not permitted above the axis or springline of the completed tunnel. Any water ingress must not cause the piping of soil or rock particles to enter the tunnel.

The design must include provisions to facilitate repair or restoration to achieve a dry tunnel in the event that leakage in excess of the allowable values occurs after construction.

No materials used in preventing or stemming water ingress must compromise the fire-life safety or the durability of the structures in which they are used. If passive fire protection or architectural finishes are required inside the tunnel, seepage drainage must be designed for and provided behind such systems.

13.9.1 Mined Tunnels

Allowable infiltration rates for mined tunnels must conform to those defined for cut-and-cover structures. See CHAPTER 12, section 12.2, for allowable infiltration rates for mined tunnels.

13.9.2 Bored Tunnels

Precast concrete tunnel linings must be designed to limit infiltration by the density of the concrete and the use of gaskets. Allowable daily infiltration rates must conform to the values in Table 13.1. All infiltration values must be measured at the source of the leak.

Table 13-1: Allowable Daily Infiltration Rates for Precast Concrete Tunnel Linings

Tightness Class	Dampness Characteristics	Dampness Definition	Allowable Daily Infiltration [gal/sf]	As applied to Bored Tunnels
1	Absolutely dry	No damp areas visible on the tunnel lining	0.00025	Zones in bored tunnel used to house electrical, systems and communications equipment.
2	Substantially dry	Occasional damp patches which do not discolor blotting paper, detectable on the tunnel lining	0.0012	Bored tunnel within limits of a station or track crossover.
3	Capillary dampness	Occasional damp patches on the tunnel lining, but no movement or water apparent to the eye or drops of water.	0.0025	All guideways or storage tracks within bored tunnel.

13.9.3 Drainage

A drainage system that will collect and remove water infiltration resulting from a waterproofing failure, as well as water discharged for cleaning or firefighting purposes, must be provided in all tunnels.

Drainage requirements for tunnels must conform to the criteria in CHAPTER 16, Mechanical Systems.

13.10 California Occupational Safety and Health Administration (Cal/OSHA) and Safety Requirements

Tunnels must be constructed to conform to the requirements of Cal/OSHA, as identified in the Tunnel Safety Orders, and on the Cal/OSHA Underground Classification that must be issued prior to construction, as well as any amendments that may be made by Cal/OSHA during the design and construction process.

The excavation sequence and initial support designs must avoid the need for workers to be under unsupported ground or freshly sprayed shotcrete.

CHAPTER 14 ARCHITECTURE AND VERTICAL CONVEYANCE

SCOPE

This chapter establishes the requirements for architectural and spatial design and vertical conveyances for the Downtown Rail Extension (DTX) project. These architectural and spatial design criteria and guidelines supplement the Caltrain Design Criteria, Chapter 3 and the California High-Speed Rail Authority (CHSRA) Design Criteria Manual, for design of the following facilities:

- Fourth and Townsend Street Station
- Transit Center train box fit-out of the lower concourse and platform levels
- Ventilation and egress structures
- Ancillary structures. The criteria and requirements for ancillary structures, including worker facilities and substation enclosures, must be agreed with Caltrain and CHSRA.

The criteria for vertical circulation, including stairs, ramps, escalators, and elevators, apply to the Fourth and Townsend Street Station, Transit Center train box fit-out, ventilation and egress structures, and ancillary structures.

Station infrastructure requirements must be coordinated with the design of the existing Caltrain surface station at 4th and King streets to avoid unnecessary duplication and redundancy.

These criteria do not apply to the existing Caltrain station at 4th and King streets or the 4th and King Railyards, which are the responsibility of Caltrain.

CODES, STANDARDS AND GUIDELINES

Architectural design and the design of vertical circulation must conform to all applicable portions of the general laws and regulations of the State of California and the City and County of San Francisco (City) and the latest edition of the following governing standards, codes, and guidelines:

- American Public Transportation Association (APTA) guidelines:
  - APTA-RT-EE-RP-001-02, Heavy-Duty Transportation System Escalator Design Guidelines (APTA Escalator Design Guidelines)
  - APTA-RT-EE-RP-002-03, Heavy-Duty Transportation System Elevator Design Guidelines (APTA Elevator Design Guidelines)
- American Society of Mechanical Engineers (ASME) A17: Safety Code for Elevators and Escalators
- Americans with Disabilities Act (ADA) Standards for Accessible Design
- California Building Code (CBC)
- Caltrain Engineering Standards
- CHSRA Design Criteria Manual
- CHSRA environmental and engineering technical memoranda

- Code of Federal Regulations (CFR)
  - Title 36, Part 1192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards
  - Title 49, Part 37, Transportation Services for Individuals with Disabilities (ADA)
  - Title 49, Part 38, Americans with Disabilities Act (ADA) Accessibility Specifications for Transportation Vehicles
- Federal Transit Administration - FTA Report No. 0123, Transit Noise and Vibration Impact Assessment Manual
- Metropolitan Transportation Commission – MTC Regional Transit Wayfinding Guidelines and Standards
- National Fire Protection Association (NFPA) standards
  - NFPA 70, National Electric Code
  - NFPA 101, Life Safety Code
  - NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems
  - NFPA 220, Standard on Types of Building Construction
- Occupational Safety and Health Administration (OSHA) regulations
- San Francisco Building Code (SFBC), which includes San Francisco Code Amendments (SF Amendments)

14.1 Station Planning Considerations and Features

The Fourth and Townsend Street Station and Transit Center train box fit-out will be designed and configured for the use of Caltrain and CHSRA. Some characteristics and planning, as described in this section, will be common to both stations.

The ability of passengers to safely and efficiently navigate between station entrances and platforms requires a simple and coherent design. To that effect, the station design must:

- Minimize the number of decisions passengers need to make
- Promote clear and logical circulation
- Provide consistent and clear directional signage
- Minimize turns to avoid passengers' becoming disoriented and conflicting movements. Where turns are unavoidable, adopt right-hand circulation to minimize conflicting passenger movements

14.1.1 Station Capacity

The critical elements of passenger circulation systems in stations are entrances and exits, passageways, vertical circulation, and platforms. These elements must be sized to accommodate the projected volume of passengers under peak period operating conditions and emergency conditions at a required level-of-service. Level of service is generally defined by the Transportation Research Board's Transit Capacity and Quality of Service Manual, 2nd Edition. Requirements for high-speed rail waiting areas are as defined by the International Air Transport Association (IATA) Airport Development Reference Manual, 9th Edition.

Table 14.1 shows the desired level of service for various station components.

Table 14-1: Desired Level of Service (LOS)

Station Component	Operating Condition		
	Normal	Delayed	Evacuation
Circulation Areas			
Open concourses	Circulation LOS B	Circulation LOS D	N/A
Corridors	Circulation LOS C	Circulation LOS D	N/A
Waiting/queuing Areas			
Commuter waiting areas on mezzanine level	Queuing LOS C	Queuing LOS E	N/A
Rail platforms	Queuing LOS C	Queuing LOS E	N/A
High-speed rail waiting area	IATA Holdroom LOS C	IATA Holdroom LOS E	N/A
Queuing at fare gates and escalators	Maximum queues must not extend to upstream escalators	Maximum queues must not extend to upstream escalators	
Platform vertical circulation (non-evacuation conditions)	Clear platform or waiting area queue in 4 minutes	Clear platform or waiting area queue in 6 minutes	N/A
Platform evacuation	N/A	N/A	Evacuate platforms in 4 minutes or less; evacuate platforms to point of safety in 6 minutes or less

The following level-of-service performance standards will be maintained for public stairways for normal use:

Stairs. LOS C: 10 to 15 square feet per person, corresponding to an average flow volume of 7 to 10 persons per foot of width per minute.

Queuing areas. LOS C: 7 to 10 square feet per person corresponding to an average spacing between persons of 3 feet to 3 feet 6 inches.

Station emergency egress requirements must conform to the requirements of the CBC and NFPA 130.

Special event occupancy loads will be accommodated through operational procedures—for example, more frequent train headways or station access controls at street level—and will not be a governing factor in the station design.

14.1.2 Accessibility

Stations must be fully accessible in conformance with CBC, ADAAG, and Occupational Safety and Health Administration (OSHA) requirements regarding access and emergency egress. A barrier-free path of travel must be provided for all passengers, including persons with disabilities, including mobility, hearing, and visual impairments. Stations must conform to the following accessibility standards:

- Each station platform must have at least one accessible entrance from an accessible route that connects directly to other transportation modes.
- At least two elevators must connect the street level entrance to the mezzanine level and the mezzanine level to the platform level.

- Elevators must be placed to provide effective redundancy along the accessible path from the station entrance to the platform.

14.1.3 Station Components

Subsections 0, Station Components/Station Entrances, through 0, Station Components/Platforms, present the requirements for station components in the sequence of the customer's path through the station, from entering the station to boarding the train. See also subsection 14.6, Vertical Circulation.

Station Entrances

The number of station entrances must be based on an analysis of customer access and egress requirements and comply with CBC and NFPA 130.

Station entrances must meet the following requirements:

- Convenient access. The location of station entrances must provide convenient access in public plazas and positioned beyond the public way to preserve sidewalk space for pedestrians. Entrances must provide access to crosswalks and adjacent transportation facilities. Where entrances extend into the public way, a minimum sidewalk width of 10 feet must be maintained.
- Clear identification. Station entrances must be clearly visible, well lit, and recognizable as a part of the blended Caltrain and CHSRA system.
- Safe environment. Station entrances must be well lit and include lockable gates. See CHAPTER 3, System Safety and Security, for more information on safety and security.
- Compatibility with surroundings. Station entrances must be integrated with the existing neighborhood aesthetic as well as provide a connecting point for other nearby transit connections. See subsection 14.4.5, Wayfinding, for more information about signage and wayfinding.
- Protection from the weather. Station entrances must have canopies to protect stair and escalator surfaces and provide shelter to passengers.

In addition, station entrances must be designed to accommodate a 100-year storm event and sea level rise for the duration of the project's life cycle. See CHAPTER 4, Environmental Requirements, for more information.

Concourse Level and Lower Concourse

The station entrances will lead to the concourse level at the Fourth and Townsend Street Station and the lower concourse at the Transit Center station. These areas will accommodate passenger amenities such as ticketing machines, maps, and schedule information and house the following infrastructure:

- Station agent booth
- The station agent booth
  The point of control for day-to-day station operations, including customer service, regulation of ticket vending, elevators, escalators, and passenger information.
- Ticket vending cluster near the agent booth

- Ticket vending infrastructure
  Include ticket and information windows and ticket vending machines for both Caltrain and CHSRA, queueing space, change machines, Clipper (or other regional system) card-charging stations, and automated teller machines. The number and location of machines depends on the operator requirements, expected ridership, and vertical circulation configuration.
- Information kiosks
- Public restrooms
- Passenger benches
- A wellness room
- Drinking fountains/water bottle filling stations
- Fare barriers and queuing space for CHSRA
- The number of barriers will be based on maximum platform capacity, with passengers boarding and alighting simultaneously on both faces of each platform.
- Caltrain card readers and card interface devices (CIDs)
- City and system maps and departure and service information conforming to MTC Regional Transit Wayfinding Guidelines and Standards
- Communications systems, including public address, public and passenger assistance telephones, and audiovisual systems that conform to ADAAG, as defined in Chapter 19, Communications.

The design of the concourse and lower concourse areas must

- be sized to allow passengers direct and unencumbered access to the station platforms based upon projected passenger flows.
- minimize cross flows and conflicting movements between arriving and departing passengers.
- must have 10 feet of minimum clearance between the floor and the lowest point in the concourse ceiling. The preferred clearance is 12 feet wherever possible without major modification to existing building structure or equipment.
- must maintain a minimum clearance of 8 feet 6 inches under signs, lighting fixtures, closed-circuit television (CCTV) cameras, and other elements wherever possible without major modification to existing building structure or equipment.

The design of the station agent booth must

- be located to facilitate supervision of the station entrances, ticket vending cluster, public restrooms, and stairs, escalators, and elevators to the platforms. The booth must be approximately 100 square feet in plan area.
- have a fully accessible interior.
- have a reservoir space at least 100 square feet for customer queuing to avoid affecting normal passenger circulation. The customer service window must be fully accessible.
- have monitors and alarms for station communications systems.

Public restrooms will be gender neutral and fully accessible. Public restrooms must not have entrance doors; a vestibule or other means must be used to block direct view into the restrooms. The following fixtures must be provided, and the number of each fixture type must be based on the anticipated ridership at each station.

- Accessible toilets with stall, door, and privacy latches
- Standard toilets with stall, door, and privacy latches
- Urinals with stall
- Sinks (lavatories) with mirrors
- Infant changing table

Platforms

Platform design must facilitate passenger circulation along platforms, queuing at platform edges and bench areas, train boarding and alighting, and queuing at or exiting vertical circulation.

All station platforms must be configured to allow level boarding, as defined in the CFR 49, Part 37, Appendix A, section 10.3.1(9) as involving a horizontal gap between the edge of the vehicle floor and the edge of the platform
of no more than 3 inches and a vertical gap of no more than 0.625 inches.

In accordance with 49 CFR Part 37, where meeting gap requirements is infeasible, the designer must recommend the use of mini-high platforms, car-borne or platform-mounted lifts, ramps or bridge plates, or similar manually deployed devices that meet the applicable requirements of 36 CFR, Part 1192, or 49 CFR Part 38. Recommended devices must be accepted by the TJPA and the operators, Caltrain and CHSRA.

Platform-level features for publicly accessible areas must include:

- Passenger benches
- City and system maps and schedule/service information
- Communications systems including public address system, public and passenger assistance telephones, blue light phones for emergency communications, and audiovisual systems, in conformance with ADAAG, as defined in Chapter 19, Communications
- Advertising displays
- Platform end gates
- Fire department facilities, including standpipes, hose cabinets, and extinguishers
- Under-platform access, where feasible, understanding Caltrain platforms are 8” above top of rail
- Emergency egress

Platform design must meet the following requirements:

- All elements of the platform area will support safe circulation and access to and from trains.
- Design must facilitate the rapid clearing of platforms of all passengers.
- Vertical circulation elements must be sited to promote balanced boarding and alighting from trains.
- Visual obstructions must be minimized. Alcoves, or hidden areas, must be avoided to promote station safety and security.
- The platform area must not contain any support or non-transit functions that may obstruct or impede the circulation of patrons.

- The path of emergency egress along the platform must be clearly identified.
- No pedestrian track crossings at the platform level will be permitted.
- Vertical clearances between the floor and ceiling are not less than 12 feet in the general platform areas, unless precluded by existing building structure. If 12 feet vertical clearance cannot be achieved, any variance must be approved by the Transbay Joint Powers Authority (TJPA).
- In limited areas, such as under partial mezzanines and at the platform ends next to the emergency stair and service area, vertical clearances may be reduced to 10 feet.
- A clearance of no less than 8 feet 6 inches must be maintained below elements such as signs, lighting fixtures, and CCTV cameras.

14.2 Fourth and Townsend Street Station

Fourth and Townsend Street Station infrastructure and requirements must be coordinated with Caltrain and CHSRA. The design and operation must be integrated with Caltrain requirements for the existing surface station at 4th and King streets to the maximum extent possible to avoid unnecessary redundancy and operating and maintenance expenditures.

14.2.1 Public Areas

Public areas of the station comprise the street-level station entrances, concourse, and platform areas. subsections 14.2.1 Public Areas/Street Level, through subsection 14.2.1 Public Areas/Platforms, discuss the programmatic, infrastructure, and spatial requirements for each of these areas.

Street Level

Station design at street level must incorporate features that promote ease of intermodal transfer between Caltrain and CHSRA and the following:

- San Francisco Municipal Transportation Agency (SFMTA) bus lines
- San Francisco Municipal Railway (Muni) Central Subway
- Caltrain surface station at 4th and King streets

Dedicated spaces for taxis, shuttle vans, paratransit service, and curbside vehicle drop-off must be coordinated with SFMTA and the existing Caltrain surface station at 4th and King streets.

Concourse Level

In addition to the requirements in subsection Station ComponentsConcourse Level and Lower Concourse, the concourse will house a lost-and-found and a first-aid station.

Platforms

Caltrain. Minimum platform dimensions must conform to CHAPTER 3 SYSTEM SAFETY AND SECURITY and the Caltrain Design Criteria. However, because passengers move in multiple directions on platforms, due

consideration must be given to platform width. Base the final platform sizing on level-of-service and emergency exiting requirements and the following geometric requirements:

- Platform width must accommodate the design parameters (headways, ridership, and level-of-service) defined in this chapter and in CHAPTER 2OWNER'S REQUIREMENTS. The minimum outboard or side platform width is 18 feet. Center platform width is a minimum of 28 feet with a preferred width of 32 feet. A design variance request must be submitted to Caltrain for approval for any nonstandard design.
- Total platform length must be a minimum of 875 feet.
- All platform boarding edges must have detectable tactile warning strips measuring 24 inches in width and running the full length of the platform. A darker "pre-warning strip" must be provided in conformance with the ADAAG.
- Horizontal clearance must be a minimum clearance from nearest track center is 25 feet for permanent structures and 16 feet for minor structures at stations (e.g., poles, posts, canopies, benches, wheelchair lifts, elevators, and escalators).
- Platform placement must be 21.7 inches from the top of rail to the top of the finished platform. The station platform edge is 5 feet 8 inches from the centerline of the nearest track.

See subsection 14.1.3, Concourse Level and Lower Concourse, for vertical clearance requirements.

CHSRA. Platform dimensions must conform to CHSRA Design Criteria. However, because passengers move in multiple directions on platforms, due consideration must be given to the platform width. Base the final platform sizing on level-of-service and emergency exiting requirements and the following geometric requirements:

- Platform width must accommodate the design parameters (headways, ridership, and level-of-service) defined in Chapter 2, Owner's Requirements. The minimum outboard or side platform width is 17 feet.
- Total platform length must be a minimum of 800 feet.
- All platform boarding edges must have detectable tactile warning strips measuring 24 inches in width and running the full length of the platform. A darker "pre-warning strip" must be provided in conformance with the ADAAG.
- Base the minimum clearance between fixed platform elements, such as escalators, stairs, guardrails, and partitions around openings, and the platform edge on pedestrian circulation requirements.
- Platform placement must be 51 inches from the top of rail to the top of the finished platform surface measured at the outer edge of the platform.
- Clear refuge areas must be provided under the platform edge at the track level. Refuge areas must be a minimum of 30 inches high and 30 inches deep along the entire length of the platform and have exits at the platform ends. If platform edge doors are provided, refuge areas are not required.

See subsection 14.1.3, Concourse Level and Lower Concourse, for vertical clearance requirements.

14.2.2 Owner and Operator Areas

The concourse and platform levels must have areas with secure and restricted access for the sole and specific use of TJPA, Caltrain, and CHSRA personnel. Exact programmatic space requirements to

accommodate the "blended" system for TJPA and the operators will be determined as the design progresses. The station operator is Caltrain.

Concourse Level

Owner and operator areas on the concourse level must include receptacles for recycling, refuse, organic waste, and hazardous waste and refuse storage rooms. Bus operator facilities may also need to be provided, but this decision is pending with SFMTA.

Caltrain Staff Rooms. Rooms for the use of Caltrain staff must include a station administration office, facility maintenance office, a janitor's closet, and storage areas for station supplies and operations and maintenance equipment.

Fire Command Post. The design must include provisions for a fire command post. See CHAPTER 15, Fire-Life Safety.

Mechanical Spaces. Provisions must be made in or next to the station to accommodate the following:

- Tunnel fan rooms and ventilation shafts
- Station electrical power supply
- Station communications and signaling equipment
- Station environmental control
- Pumps for stormwater and sanitary sewer
- Elevator/escalator machinery
- Valve rooms for station deluge and sprinkler system
- Alternative automatic fire extinguishing system equipment

The requirements, sizing, and location of various mechanical spaces and equipment must be coordinated with the appropriate design disciplines and conform to the requirements in CHAPTER 15, FIRE-LIFE SAFETY; CHAPTER 16, MECHANICAL SYSTEMS; and CHAPTER 17, Electrical Systems, as appropriate.

The design of mechanical spaces and other operator areas must consider requirements for the maintenance and replacement of equipment such that (a) routine maintenance can be performed without disrupting normal station operations and (b) equipment that is large and difficult to move can be easily replaced.

Platform Level

The platform level must accommodate a security booth.

The platform level must also house the following Caltrain spaces:

- Facilities maintenance cleaning closet (one per platform) with water and power sources for floor scrubber machines
- Signals maintenance facility
- Communication battery room
- Third-party communications room

- Electric switch room
- Battery room

14.3 Transit Center

The Transit Center train box fit-out must be configured for the use of Caltrain and CHSRA. This section discusses the spaces that must be fit-out for the DTX.

14.3.1 Public Areas

The main public areas of the station are the station entrance in the grand hall, the lower concourse, and the platform level. Programmatic, infrastructure, and spatial requirements for each of these areas is provided.

Lower Concourse Level

See subsection 14.3.2, Lower Concourse Level.

Platform Level

Caltrain. Minimum platform dimensions will be the more stringent of and in accordance with the requirements in Caltrain Design Criteria, Chapter 3. However, because passengers move in multiple directions on platforms, due consideration must be given to platform width. Base the final platform sizing level-of-service and emergency exiting requirements and the following geometric requirements:

- Platform width must accommodate the design parameters (headways, ridership, and level-of-service) defined in this chapter and in CHAPTER 2, OWNER'S REQUIREMENTS. The minimum center platform width is 28 feet.
- Total platform length must be a minimum of 875 feet.
- All platform boarding edges must have detectable tactile warning strips measuring 24 inches in width and running the full length of the platform. A darker "pre-warning strip" must be provided in conformance with the ADAAG.
- Horizontal clearance from nearest track center must be a minimum of 25 feet for permanent structures and 17 feet for minor structures at stations (e.g., poles, posts, canopies, benches, wheelchair lifts, elevators, and escalators).
- Platforms must be 21.7 inches from the top of rail to the top of the finished platform. The station platform edge is 5 feet 8 inches from the centerline of the nearest track.

See subsection 14.2.1, Platforms, for vertical clearance requirements.

CHSRA. Because passengers move in multiple directions on platforms, due consideration must be given to the platforms' width. Minimum platform dimensions will be the more stringent of, and in accordance with the CHSRA Design Criteria. Base the final platform sizing on level-of-service and emergency exiting requirements and the following geometric requirements:

- Platform width must accommodate the design parameters (headways, ridership, and level-of-service) defined in this chapter and in CHAPTER 2OWNER'S REQUIREMENTS. Total platform length is a minimum of 800 feet.
- All platform boarding edges must have detectable tactile warning strips measuring 24 inches in width and running the full length of the platform. A darker "pre-warning strip" will be provided in accordance with the ADAAG.
- Minimum horizontal clearances between fixed platform elements such as escalators, stairs, guardrails, or partitions around openings and the platform edge are based on pedestrian circulation requirements.
- Platforms must be 51 inches from the top of rail to the top of the finished platform surface measured at the outer edge of the platform.
- A clear refuge space must be provided under the platform edge at the track level. Refuge areas must be a minimum of 30 inches high and 30 inches deep along the entire length of the platform and have exits at the platform ends. If platform gates or doors are provided, refuge areas are not required.

See subsection 14.1.3 for vertical clearance requirements.

14.3.2 Owner and Operator Areas

The lower concourse and platform levels must have areas with secure and restricted access for the sole and specific use of TJPA, Caltrain, and CHSRA personnel. Exact programmatic space requirements to accommodate the "blended" system for TJPA and the operators will be determined as the design progresses. The assumed station operator is TJPA.

Lower Concourse Level

TJPA-operated Facilities. The following facilities will be operated by the TJPA:

- Security office – required for TJPA
- Police office (for transit police) – required for SFPD
- Alternate security operations center, if feasible, which would include a break room and conference room for security and SFPD use
- Security-SFPD break room
- Security-SFPD conference room
- Men security lockers/restroom
- Women security lockers/restroom
- Security storage room
- SFPD men's lockers/shower/restroom
- SFPD women's lockers/shower/restroom
- TJPA security lockers and restrooms with storage room
- Visitor/conference rooms

- Janitor's closet
- Refuse storage rooms
- Staff wellness room

CHSRA-specific Facilities. The following are CHSRA-specific facilities:

- Fare barriers
- Ticket information windows
- Ticket vending machines
- Business lounge, including food storage/prep and unisex restrooms
- Janitor's closets
- Facilities to support train operations, including:
  - Administrative support office
  - Crew lounge/ready room
  - Shift supervisor office
  - Car inspector office
  - Gang foreman office
  - Cleaning machine storage
  - Maintenance equipment storage lockers
  - Train grooming team ready room
  - Commissary food storage
  - Commissary office
  - Staff lockers/showers/restrooms

Caltrain-specific facilities. The following are Caltrain-specific facilities:

- Ticket vending machines
- Departure board displays and infrastructure
- Information kiosks
- CIDs
- MTC Regional Transit Wayfinding Guidelines and Standards
- Caltrain conference room
- Signals maintenance facility with parking for three ladder rack trucks at street level
- Ready room
- General storage, mainly used for customer service materials
- Car inspector office
- Rail operations supervisor office
- Staff locker rooms, showers, and restrooms

- Supply storage

Shared space. Vendor space available to business owners.

Mechanical Spaces. Provisions must be made in or next to the station for the following:

- Tunnel fan rooms and ventilation shafts
- Station electrical power supply
- Station communications and signaling equipment
- Station environmental control
- Pumps for stormwater and sanitary sewer
- Elevator/escalator machinery
- Valve rooms for station deluge and sprinkler system
- Alternative automatic fire extinguishing system equipment

The requirements, sizing, and location of the various mechanical spaces and equipment must be coordinated with the appropriate design disciplines and conform to the requirements in CHAPTER 15FIRE-LIFE SAFETY, CHAPTER 16MECHANICAL SYSTEMS, and CHAPTER 17Electrical Systems , as appropriate.

The design of mechanical spaces and other operator areas must consider requirements for the maintenance and replacement of equipment such that (a) routine maintenance can be performed without disrupting normal station operations, and (b) equipment that is large and difficult to move can be easily replaced.

Platform Level

The platform level must house the following:

TJPA-operated Facilities. The following are TJPA-operated facilities:

- Facilities maintenance cleaning closet (one per platform), which include water and power sources for the floor scrubbers
- Facilities equipment storage room, including a charging port for service equipment such as small lifts
- Communication battery room
- Third-party communications room
- Electric switch room
- Battery room

Restrooms and janitor closet CHSRA-specific Facilities. The following:

- Platform agent booth (one per platform)
- Refuse rooms (three per platform)
- Maintenance equipment storage lockers (three per platform)
- General storage locker (one per platform)
- Cleaners' room (one per platform)

- Cleaning supplies storage room (one per platform)
- Station storage room (one per platform)

Caltrain-specific facilities. The following:

- Refuse rooms (three per platform)
- Vehicle maintenance equipment storage room
- Platform operations room
- Caltrain train control and communications room

The requirements, sizing, and location of the various mechanical spaces and equipment must be coordinated with appropriate design disciplines.

The design of mechanical spaces and other operator areas must consider requirements for the maintenance and replacement of equipment such that (a) routine maintenance can be performed without disrupting normal station operations, and (b) equipment that is large and difficult to move can be easily replaced.

14.4 Environment and Shared Design Characteristics

14.4.1 Climate

See CHAPTER 16, Mechanical SystemsMECHANICAL SYSTEMS, for the design parameters for temperature and humidity control within the station public and ancillary spaces.

14.4.2 Lighting

See CHAPTER 17, Electrical Systems, for the design parameters for illumination within the station public and ancillary spaces.

Station design must incorporate and maximize the use of natural lighting to reduce energy consumption.

Where natural lighting is not a feasible option, all station lighting, including those used for public areas, back-of-house areas, or accent lighting, must minimally meet Title 24 and best practice lighting footcandle requirements.

14.4.3 Acoustics

Acoustical calculations to determine the amount, type, and placement of acoustical treatments must conform to FTA Report No. 0123, Transit Noise and Vibration Impact Assessment Manual.

See subsection 14.4.6, Materials and Finishes, for the criteria for materials and finishes for the acoustic treatment of various areas of the station.

14.4.4 Sustainability

No specific sustainability performance goals have been established for the DTX project, but the principles of sustainability, where applicable, will be applied. Sustainable design opportunities in the areas of water savings, materials selection, and the use of recycled materials must be considered. Also, for areas affected by the presence of groundwater, methods to reduce power consumption related to dewatering pumping over the project's life cycle will be evaluated. The designer must give due consideration to each of the categories of the United States Green Building Council and seek to maximize opportunities for sustainability in the execution of the DTX project.

14.4.5 Wayfinding

Fixed message signage will conform to MTC Regional Transit Wayfinding Guidelines and Standards.

The following wayfinding and information signage designed for customer orientation must conform to regulatory requirements and accessibility guidelines:

- Station and operator identification
- System identification and customer orientation signage
- Ticket vending and use information
- Route and destination information for boarding passengers
- Station area orientation for arriving passengers including transit connection orientation
- Accessible routes to platform or street level, including visual, tactile, or Braille signage in accordance with ADAAG and CBC Title 24
- Regulatory signage
- Emergency egress routes
- Room identification and function signs

14.4.6 Materials and Finishes

Materials and finishes for floors, walls, and ceilings must be safe, resistant to fire and vandalism, durable, maintainable, cost effective, and aesthetically appealing. Materials must meet applicable ASTM International's testing standards and the following general requirements.

Materials will be hard, dense, non-porous, non-staining, and resistant to acids, alkalis, ultraviolet rays, chemicals, salts, and dirt for color retention and finish, longevity, and low maintenance.

Smooth surfaces are preferred over textured surfaces for ease of cleaning, with the exception of the following:

- Metal panels must be designed to reduce the visual impact of scratches.
- Flooring must provide adequate slip resistance. However, highly textured concrete must not be used as it is slippery when wet.

The design must specify materials that do not interfere with wireless communications.

Materials and finishes for non-public areas of the station must meet the same performance requirements as those for public areas. As the non-public areas are subject to reduced traffic and wear and tear, the following materials may be used, provided the requirements specified herein for safety, durability, and maintenance are met:

- Acoustic ceiling tile
- Exposed fire-rated structure
- Concrete masonry unit (painted)
- Vinyl composition tile
- Cement/vermiculite mix (smooth troweled or spray-applied in non-exposed areas only)

Fire Resistance and Smoke Generation

Materials will be certified Class A materials, offering maximum resistance to fire and having minimum burning rate, smoke generation, and toxicity characteristics.

Building construction type and fire separation must conform to the CBC. Public and ancillary occupancies must be separated from non-transit occupancies by two-hour fire-rated construction, as defined in NFPA 220. The fire ratings of doors must conform to NFPA 80.

Resistance to Vandalism

Materials used in the design must be difficult to deface, damage, or remove. All surfaces in public areas must be scratch-resistant or patterned to hide scratches and finished in a manner that allows for the easy removal of graffiti through normal maintenance techniques. The design must include provisions and procedures for repairing damage for each finish used in public areas within 9 feet of the floor surface.

Fasteners must be tamper-resistant and concealed wherever possible.

Platform areas must have intrusion protection and closed-circuit video surveillance 24 hours a day, seven days a week to protect electric multiple units and trainsets against vandalism.

Slip Resistance

Flooring materials must have slip resistant surfaces. Stairways, landings, platform edges, and areas around equipment must use materials with high non-slip properties.

Flooring materials must be ADA-compliant.

Table 14.2 specifies the coefficient of friction for floor materials.

Table 14-2: Flooring Coefficient of Friction

Location	Coefficient of Friction (min)	
	Wet	Dry
General Floor – level interior	0.6	0.6
General Floor – exterior (areas immediately next to entrances)	0.8	0.8
Stair tread – interior and exterior	0.6	0.75
Ramp (slope > 3%) – interior and exterior	0.8	0.85
Tactile tiles – interior and exterior	0.5	0.8

Freeze Thaw Resistance

Materials must have low water absorption and the ability to resist freezing. Impervious flooring with a water absorption rate of less than 0.5 percent must be provided at station entrances and in areas subject to exterior weather directly or indirectly. Internal flooring not affected by the weather must have an absorption rate of less than 3.0 percent.

Attachment

The design of attachments must prevent the dislodgement of finishes resulting from temperature variation, vibration, wind, seismic activity, or other causes.

Do not use adhesive anchors in sustained tensile-load overhead applications.

Reflectance

Materials must be bright and light-colored to enhance reflectivity and maximize the effectiveness of lighting using a minimum number of fixtures.

Conversely, reflective materials must not interfere with the functioning of CCTV or the readability of wayfinding signage. Material reflectivity must not conflict with other safety-related functions including slip resistance. Do not use mirrored surfaces except for accent items.

Coordinate materials selection with the lighting design to provide the recommended reflectance values for station surfaces shown in Table 14.3

Table 14-3: Reflectance Value for Station Surfaces

Surface	Reflectance Value
Painted surfaces (ceilings and walls)	55% to 70%
Unpainted surfaces (ceilings and walls)	40% to 60%
Floors (dark)	15% to 20%
Floors (light)	20% to 30%

Reflectance values do not consider the accumulation of dirt.

Abrasion Resistance

Materials used for flooring and wall surfaces that can be touched or rubbed against by passengers and luggage must resist wear and easily conceal dirt and scratches. Finishes must resist the effects of cleaning materials and procedures over their lifetime.

Floor surfaces must resist abrasion and other damage resulting from passenger traffic, cleaning equipment, or other maintenance equipment.

Sound Absorption

Material that absorb sound must be used to promote an environment where patrons can communicate clearly and easily and buildup of excessive noise is suppressed. Placement of sound absorptive materials must be coordinated with the station's public address system to ensure that audibility requirements are met.

Sound absorptive materials must comply with the following characteristics:

- Lightweight
- Low flammability and smoke emission
- Cleanable and vandal-resistant
- Long-term reliable bond for fixing to flat horizontal and vertical surfaces and curved surfaces
- Stable when exposed to high positive and negative pressures
- Resistant to vibration
- Suitable for a wet environment
- Rot-proof and odorless
- Resistant to mold and rodents

Ease of Maintenance and Replacement

Materials must be easily maintained, repaired, or replaced. Material, fastening, and joint selection must support the removal and replacement of a section of finish without damaging or affecting the finish of adjacent sections.

Avoid using surfaces or details that complicate cleaning or collect dirt.

14.5 Ventilation and Emergency Egress Structures

Spatial planning, materials, and finishes for ventilation and emergency egress structures must conform to the requirements for non-public areas of the Fourth and Townsend Street Station. See subsection 14.2, Fourth and Townsend Street Station.

The building environment must conform to the requirements in CHAPTER 15FIRE-LIFE SAFETY, CHAPTER 16, MECHANICAL SYSTEMS, and CHAPTER 17, Electrical Systems.

Above-grade building exteriors may require specific contextual materials that are compatible with adjacent buildings. The street level appearance of ventilation structures must be coordinated with the San Francisco Planning Department.

14.6 Vertical Circulation

14.6.1 Stairs

Public stairs must conform to the requirements of this section. Stairs provided for emergency egress only must comply with the requirements of NFPA 130 and CBC Section 443, Fixed Guideway Transit and Passenger Rail Systems.

Stairs will be the primary mode of vertical circulation where the vertical rise between levels is less than 12 feet. Stairs are recommended as the primary mode of vertical circulation in the downward direction where the vertical rise between levels is less than 20 feet.

Stairs must be well lit, visible, and easily identifiable as a means of access to the levels they connect.

Stairs must include runnels to facilitate drainage, maintenance, and cleaning.

When paired with escalators, stairs must rise at the same angle as the escalator. Stair nosings must be at or below the line of the escalator treads such that the top of stair handrail is below the height of the escalator balustrade.

Width

Stair widths must be based on anticipated levels of service. The minimum stair width is 5 feet, unless precluded by existing building structure. If a stair width of 5 feet cannot be achieved, the designer must submit a variance request for review and acceptance by the TJPA. See Chapter 1, section 1.8, Variances and Changes to Design Criteria.

Queuing and Run-off Space

Sufficient queuing and run-off space must be provided at the top and bottom of all stairs. The minimum queuing and run-off space must be the greater of the stair width or 8 feet. When a stair is paired with an escalator, the queuing and run-off areas must be coincident.

Level of Service

The following level of service (LOS) performance standards will be maintained for public stairways for normal use:

Stairs. LOS C — 10 to 15 square feet per person, corresponding to an average flow volume of 7 to 10 persons per foot of width per minute.

Queuing areas. LOS C — 7 to 10 square feet per person corresponding to an average spacing between persons of 3 feet to 3 feet 6 inches.

Headroom

A minimum clear headroom of 9 feet, measured perpendicular from the line of the tread nosing to the underside of the ceiling, must be maintained, unless precluded by existing building structure. If 9 feet of clear headroom cannot be achieved, the designer must submit a variance request for acceptance by the TJPA. See Chapter 1, section 1.8, Variances and Changes to Design Criteria.

Guardrails and Handrails

Barriers, guardrails, and handrails must conform to the requirements of the CBC and San Francisco Building Code. All finishes must be Grade 316 stainless steel. If glass is used, it must be laminated and tempered.

14.6.2 Ramps

Ramps must conform to the accessibility provisions of the CBC, ADAAG, and the following:

- The maximum slope of a ramp must not exceed 1:12 along its entire length.
- All ramps with a rise exceeding 6 inches must have handrails conforming to the handrail requirements specified for stairs. See subsection 14.6.1, Guardrails and Handrails.
- The level change of ramps within passenger circulation paths must be limited to less than 30 inches.
- The minimum width for ramps must be 5 feet to allow free passage of wheelchairs. Ramps located within corridors must extend the full width of the corridor.
- Clear landings must be provided at the top and bottom of each ramp and must extend the full width of the ramp by a minimum length of 60 inches.
- Floors with a slope of less than 1:20 do not need to conform to the requirements for ramps.

14.6.3 Escalators

Escalators will be the primary mode of vertical circulation where the vertical rise between levels exceeds 12 feet, except where stairs are required, in lieu of escalators, to meet projected passenger loads.

Escalator loading, controls, and other key aspects for operation must conform to the requirements and standards in ASME A17.1.

Space Requirements

Queuing and Run-off Space. A minimum unobstructed queuing and run-off space of 25 feet must be maintained at the top and bottom of each escalator, as measured from the escalator working points. Where escalators are provided in sequence, and there are no pedestrian cross-flows or other obstructions to passenger movement, the minimum requirement may be reduced by 25 percent. The width of the queuing and run-off space must correspond
to the modular width of the escalator.

Headroom: A minimum clear headroom of 9 feet, measured perpendicular from the line of the tread nosing to the underside of the ceiling, must be maintained.

Design Features

Escalators must be heavy-duty, commercial grade with the following design features:

Width. The nominal width of all escalators must be 48 inches, or 40 inches measured at a point between the skirt panels. The designer is responsible for determining the actual dimensional requirements for escalators from information available from current suppliers.

Vertical Rise. Escalators will operate on a 30-degree incline from the horizontal. Vertical rise will be determined from design drawings for the Fourth and Townsend Street Station.

Seismic Support System. Escalators must have a combination slip/sliding seismic support system for end and intermediate supports. See CHAPTER 10, Seismic Design.

Treads. Design Class A and B escalators must have three contiguous treads level beyond the comb plate at the top and bottom landings. Design Class C escalators must have four contiguous level treads beyond the comb plate at the top and bottom landings.

Landing Plates. Landing plates must be level. Adjacent floors will have a texture that contrasts with the landing plate for detection by persons with visual impairments.

Handrails. V-groove, synthetic rubber or neoprene covered synthetic fabric, outdoor Type 2.

Balustrades. If glass balustrades are used, a protective film must cover the glass surfaces in areas within the reach of passengers.

Load rating. 300 pounds per step.

Power supply. 480 V, 3 phase, 60 Hz.

Motor and Controls. Motors and controls must have the following features:

- Remote escalator control panels that include start and stop, direction selection, and emergency brake reset functions.
- Pressure-activated emergency stop buttons and key actuated directional switches. that are mounted at the upper and lower landing newels
- A hinged cover for the emergency stop button that will sound an alarm when opened.
- A control panel installed in the machine room for truss heating and pit lights and receptacles. The control panel must house an appropriately sized circuit breaker, heating contactor, and a key switch on the enclosure door.
- Capability of being stopped locally by a manual stopping device at the escalator.
- Motors that comply with National Electrical Manufacturers Association MG 1, Insulation Class B, and have wye-delta or solid-state starting.
- Motors and controls that can run on partial windings (at reduced power) when not under full load.
- Stopping mechanism that allows the escalator to coast to a stop before applying the brakes will be provided, unless stopping is initiated by a safety device.
- Step drive mechanism equipped with automatic step-chain lubricators.

- Metal oil drip pan covering the full width and length of the escalator to collect and hold oil and grease drippings from lubricated components. The pan must be designed to sustain a load of 250 lbf on a 1.0 square-foot area at any location without permanent deflection.

Escalators must be interlocked with the fire alarm system to enable the fire alarm system to remotely stop an escalator from moving in the opposite direction of the evacuation route during an emergency as part of a pre-planned evacuation response.

Speed. Speed must not exceed 90 feet per minute (fpm). Units must be provided with an overspeed governor that is activated if the speed of steps exceeds rated speeds by more than 20 percent.

Safety Features. Escalators must conform to the following safety requirements:

- Be constructed of noncombustible materials.
- Be equipped with red and green indicator lights at least 2 inches in diameter in both balustrade newels at both the upper and lower landings. A green light indicates entrance end, and a red light indicates exit end. When the escalator is stopped, red lights are illuminated at both ends.
- Have recessed light fixtures with flush mounted lenses in skirt panels to each side of the combplates.
- Have step upthrust devices at upper landings that are activated if a step is displaced against the upthrust track at the upper curve in passenger-carrying line of track system.
- Have comb-step impact devices that are activated if a force is applied in the direction of travel that exceeds the following:
  - A horizontal force of 112 lbf at either side or 225 lbf at the center of the front edge of the combplate
  - A resultant force in upward direction of 150 lbf at the center of the front edge of the combplate

Maintenance and Replacement. Escalator design must allow for routine operations and maintenance without disruption to normal station operations. Provisions must be made for replacing escalator components, as required, beyond the design
life of the escalator.

Operational Performance

Level of Service. The following LOS performance standards must be maintained:

Escalators: 70 persons per minute

Queuing areas: LOS C — 7 to 10 square feet per person, corresponding
to an average spacing between persons of 3 feet to 3 feet 6 inches

Hours of Operation. Hours of operation are 24 hours per day, 7 days per week.

Operating Environment . Escalators must be able to operate in temperatures ranging from +25 degrees Fahrenheit (°F) to +120°F (dry bulb) and all conditions of relative humidity while exposed to airborne dust and debris.

Escalators must be in a secured area when the station is closed and be located under cover to protect from the effects of direct sunlight, rain, and snow. Weatherproofing requirements for escalators must be consistent

with exposure conditions. Corrosion resulting from exposure and galvanic action from the use of dissimilar metals must be avoided.

Escalator design must consider the thermal expansion and contraction of complete escalator assemblies and for any movement of the facility caused by trains braking when fully loaded.

Direction of Travel

Direction of travel must be either direction, and the unit must be up and down reversible.

Monitoring of Escalator Operation. Escalators must be provided with a microprocessor unit that monitors safety devices, motor temperature, and escalator speed and records in a nonvolatile memory the date, time, and device identification if a safety device is activated or escalator malfunctions.

Escalator operation must be capable of being monitored and controlled through the supervisory control and data acquisition system (SCADA).

Reliability, Availability, Safety

Escalator reliability requirements are based on the following parameters.

- System operating time: 20 hours per day (7,300 hours per year)
- Preventive maintenance: 4 hours per day
- Maximum requirements:
  - 90 percent of full load capacity for peak periods of 2-hour duration twice each day
  - 50 percent of full load capacity during off-peak periods

Escalator design must conform to APTA Escalator Design Guidelines for 95 percent availability and include safety devices,
barriers, and signage in conformance with the ASME Safety Code for Elevators and Escalators.

14.6.4 Elevators

Hydraulic elevators must be provided at the Fourth and Townsend Street Station as follows:

- A minimum of two elevators must connect the street level with the concourse level
- A minimum of two elevators must connect the concourse level with the platform level

Elevator loading, controls, and other key aspects for operation must conform to the standards in ASME A17.1.

Higher capacity freight elevators must be provided in ventilation buildings.

Each platform at the Fourth and Townsend Street Station must be serviced by two elevators, or by a single elevator and an alternate means of ADA-compliant access, such that platforms remain fully accessible when one elevator is out of service.

Queuing and Run-off Space

The clear elevator landing depth to any obstruction must be a minimum of the greater of either (a) 1.5 times the depth of the cab by the full width of the elevator or (b) 10 feet by the full width of the elevator.

Elevator landing areas must not impede general passenger circulation or be hidden from view.

Queuing space must be distinct and separate from the space provided for other vertical circulation elements and equipment.

Location

Elevator locations will depend on specific site constraints and safety and security requirements.

Depending on the availability of surface right-of-way, escalators from street level to the concourse level and from the concourse level to the platform level may be in different locations. Each platform at the Transit Center and Fourth and Townsend Street Station must have one dedicated service elevator.

Elevator locations must maximize safety, accessibility, and visibility and maintain pedestrian flow.

Safety. Where feasible

- elevators must be located at manned or partially manned entrances.
- elevators must be visible to security personnel, station staff, and the public. Shafts and cabs must be transparent for maximum visibility of the cab interior. CCTV surveillance must be provided within the cabs and at all elevator waiting areas.
- elevators at street level must not impair the visibility of the drivers of surface vehicles on roads next to the station entrances.

Accessibility. Elevators must be located to

- conveniently serve all customers and facilitate access for persons with limited mobility or other disabilities.
- serve the broadest possible portion of the station's service area.
- provide direct access to the local pedestrian circulation network, including sidewalks, plazas, building entrances, and crosswalks.
- provide convenient access to other modes of public transportation.
- be in close proximity to other vertical circulation elements.

Pedestrian Flow. Elevators must not obstruct pedestrian circulation on sidewalks and in the public right of way.

Elevators will be located as close as possible to the direct path of travel between station entry and the platform. However, the elevator location will not obstruct general passenger circulation or visually obscure other vertical circulation elements.

Design Features

Elevators must be heavy-duty commercial-grade as follows:

Passenger Elevators. As follows:

- Capacity: 3,500-5,000 lbs, net passenger capacity
- Rated Speed: 125-450 fpm, full load up direction
- Vertical Rise: as required
- Power Supply: 480 V, 3 phase, 60 Hz

Service Elevators. As follows:

- Class C2 loading
- Capacity: 10,000 lbs net capacity for interior service elevators
- Capacity: 10,000 lbs net capacity for loading dock service elevator
- Rated Speed: 2000 fpm, full load up direction
- Vertical Rise: As required
- Power Supply: 480 V, 3 phase, 60 Hz

Size. As follows:

- Elevator size must comply with ADA and emergency service requirements
- Elevators must be able to accommodate wheelchairs
- Elevators must be able to accommodate least one horizontally positioned stretcher or gurney
- Elevator size must consider local characteristics, including bicycle commuters, customers with baggage, and requirements for station cleaning and maintenance equipment

Frames. Cars frames must be of stainless-steel material or galvanized.

Hoistway Entrances. Hoistway entrances must include doors, doorjambs, sills, hardware, transom panels, and accessories. Sight guards (of the same finish as the doors) must conceal unfinished material or construction.

Controls. Elevator controls must conform to ASME A17.1. Elevator controls must include the following:

- Cabinet-type programmable logic controller-based car controller
  designed with built-in internal diagnostics, which are readily accessed and interpreted without priority codes. No decaying memory will be permitted.
- Solid-state elevator starter
  containing current limiting soft start and fault detection, phase reversal, and phase loss detection.
- Phase I emergency recall key switch station at elevator landings
  for the use of the San Francisco Fire Department (SFFD). In addition, a Phase II key switch will be provided on each elevator cab control panel, providing exclusive control of elevator movements to emergency personnel.

Where elevators are paired, interlocked controls must be provided such that only one elevator responds to a call.

Avoid the use of propriety programs, hardware, or software.

Additional requirements for elevators for firefighter use must conform to the requirements of the CBC and SFFD administrative bulletins.

Machine Rooms. Machine rooms must be provisioned with equipment that is appropriate to the elevator type.

Safety Features. Elevators must conform to the following safety requirements:

- Elevators must have power-operated doors that operate automatically in response to calls and are governed by safety controls.
- Emergency power during a power failure. The car lighting, car alarm, and the exhaust blower must be supplied with emergency power over the same feeders that supply normal power to the elevator controllers. In addition, the design will include a car-mounted battery unit to operate the alarm bell and lighting.
- Elevator fire recall landing design must include provisions whereby all affected elevators return to the fire recall landing immediately after power is transferred to the building emergency power system.
- Aesthetics for Exterior Elevators. The scale, materials, and form of elevators at street level must complement the surrounding urban context and minimize visual impacts on adjacent structures.

Operational Performance

Hours of Operation. Hours of operation are 24 hours per day, 7 days per week.

Operating Environment. Elevators must be able to operate in temperatures ranging from +25°F to +120°F (dry bulb) and all conditions of relative humidity while exposed to sunlight, rain, snow, and airborne dust.

Elevators exposed to rain must continue to operate safely and function without interruption.

Machinery in elevator equipment rooms must be able to operate in underground temperatures ranging from 25°F to 85°F (dry bulb) and all conditions of relative humidity while exposed to airborne dust.

Noise. Steady-state noise produced by elevators or associated equipment (excluding entrance door operations) must not exceed 65 dBA in public spaces. Noise produced by the operation of the elevator door must not exceed 65 dBA 3 feet or more from the elevator door, inside or outside of the elevator cab.

Monitoring and Control of Elevator Operation. Elevator operation must be capable of being monitored through the SCADA system.

Elevators must have remote control capabilities for both emergency and routine operations. Remote control will originate from the Security Operations Center, using the link between the elevators and the SCADA system.

Reliability, Availability, Safety

Elevator reliability requirements are based on the following parameters.

- System operating time: 20 hours per day (7,300 hours per year)
- Preventive Maintenance: 4 hours per day
- Maximum requirements:
  - 90 percent of full load capacity for peak periods of 2-hour duration twice each day
  - 50 percent of full load capacity during off peak periods

Elevators must meet APTA Elevator Design Guidelines for 97 percent availability.

Elevator safety devices must conform to ASME A17.1, Safety Code for Elevators and Escalators.

CHAPTER 15 FIRE-LIFE SAFETY

SCOPE

This section establishes the requirements for fire-life safety, including the fire alarm system, fire suppression system, firefighters' air system, blue light stations, and emergency egress. These criteria apply to the Downtown Rail Extension (DTX) mined tunnel, cut-and-cover structures, the Fourth and Townsend Street Station, Transit Center train box fit-out, egress shafts, ventilation buildings, and ancillary structures.

This chapter addresses specific fire-life safety elements only. The communications aspects of the fire-life safety systems—emergency telephone, radio, variable message signs, and public address—are addressed in CHAPTER 19, Communications. CHAPTER 12, STRUCTURES, and CHAPTER 14, ARCHITECTURE AND VERTICAL cONVEYANCE, contain requirements for fire-resistant construction. CHAPTER 17, Electrical Systems, contains electrical requirements, including requirements for emergency power and lighting.

CODES, STANDARDS AND GUIDELINES

The design of fire-life safety elements and systems for the DTX must conform to the latest edition of the following standards, codes, and guidelines unless otherwise specified in these criteria:

- American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering
- Americans With Disabilities Act (ADA) Standards for Accessible Design
- California Building Code (CBC)
- Federal Railroad Administration (FRA) Accessibility Standards Applying to Passenger Rail Cars
- National Fire Protection Association (NFPA) Standards
  - NFPA 10, Standard for Portable Fire Extinguishers
  - NFPA 14, Standard for the Installation of Standpipe and Hose Systems
  - NFPA 70, National Electrical Code (NEC)
  - NFPA 72, National Fire Alarm and Signaling Code
  - NFPA 101, Life Safety Code
  - NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems
  - NFPA 750, Standard on Water Mist Fire Protection Systems
- Threat and Vulnerability Assessment for the Transbay Program. 2022. Prepared by AECOM for the Transbay Joint Powers Authority.
- San Francisco Building Code (SFBC), which includes San Francisco Code Amendments (SF Amendments)
- San Francisco Fire Department (SFFD) Administrative Bulletins

15.1 Design Fire Size

Design fire sizes are shown in Table 15.1.

Table 15-1: Design Fire Sizes

Location	Maximum Fire Size (Mw)	Notes
Station Concession	5	Fourth and Townsend Street Station only
Trash/Baggage	1.5	Fourth and Townsend Street Station and tunnels
Train	20	Fourth and Townsend Street Station and tunnels; fast fire growth rate

In addition to the design fire sizes shown in Table 15-1, tunnel and station design must accommodate the fire sizes indicated in the Program's Threat and Vulnerability Assessment.

15.2 Emergency Management

Caltrain's Central Control Facility (CCF) will have the ability to manage all emergency situations in the tunnel, the Fourth and Townsend Street Station, and portions of the Transit Center station (pending execution of the Master Cooperative Agreement with Caltrain and future CONOPS agreements). Additionally, incident command (fire department) must have the ability to override remote control and control locally the following systems for emergency response:

- Emergency ventilation system
- Fire detection and alarm system
- Public address system
- Standpipe system

The CCF will have system monitoring, control and communication capability of the following:

- Two-way FM radio communications with:
  - Operating personnel
  - Personnel at the CCF and the local train control room at the Transit Center
  - San Francisco Fire Department (SFFD), Emergency Medical Services, and San Francisco Police Department personnel including those inside the station and tunnels
- Close-circuit television system
- Public address system
- Telephone systems
- Supervisory control and data acquisition system
- Station and tunnel heating, ventilation, and air conditioning normal and emergency systems
- Fire alarm and suppression systems
- Electrical distribution system

15.2.1 Ventilation System Monitoring and Control

In fire or emergency mode, the station and tunnel ventilation system must be controllable by the fire alarm system. Input through the fire alarm system must override all other ventilation system controls.

The ventilation console video display unit at the CCF will

- depict the tunnel with multiple emergency ventilation zones.
- Indicate which control panel is in control of the tunnel ventilation system.
- monitor the status of the tunnel ventilation system and show the current operating mode and emergency evacuation direction, if associated with the operating mode.
- allow the Operations and Control Center (OCC) operator to define (or redefine) the emergency circumstances in terms of disabled train location and emergency evacuation direction.
- allow the CCF operator to initiate the most appropriate emergency ventilation mode to automatically energize fans in their required mode and bring motor-operated dampers to their required emergency positions.

15.2.2 Fire Command Posts

A primary fire command post must be located in the Transit Center station for the use of emergency responders for the management of fire and security emergencies. A secondary fire command post with duplicate equipment must be provided at the Fourth and Townsend Street Station.

Fire command posts will provide firefighters and emergency responders with access to the following:

- Fire alarm control panel
- Visual mapping of the areas being monitored by the fire alarm system that shows all emergency exits and routes by which firefighters may reach the area where an emergency condition is indicated
- Public address system with the ability to override all other public address announcements
- Preprogrammed emergency messages for display on variable message signs
- Status, location, and direction of trains in the tunnels and where the traction power is energized
- Status and controls of emergency ventilation fans, dampers, and other emergency ventilation equipment
- Status and controls of escalators and elevators
- Status of emergency exit stair doors
- Status and controls of the uninterruptible power supply (UPS) system
- Digitized floor plans of the DTX facilities showing the locations of fire suppression systems, means of egress, and emergency equipment closets
- Sufficient floor space for a desk, computer equipment, and drawings

15.3 Fire Alarm System

The fire alarm system consists of fire alarm control panels and field-mounted devices, such as manual fire alarm pull stations, automatic fire detection devices, audible and visual alarm indicators, and auxiliary control devices.

15.3.1 Fire Alarm System Requirements

A fire alarm system must be installed in stations, police zone facilities, ventilation structures, train control rooms, traction power facilities, and other wayside system structures. The fire alarm system must be fully addressable at all levels and conform to the National Fire Protection Association (NFPA) 72 requirements for a remote station system.

The fire alarm system must be a distributed intelligence addressable-type system, comprising a primarily microprocessor-based, intelligent-type local fire alarm control panel and associated peripherals.

The system must be designed to have 25 percent spare capacity. Each fire alarm control panel must have 25 percent spare fire alarm-initiating circuits, indicating appliance circuits and auxiliary control circuits, and 25 percent spare device or auxiliary control relay capacity.

The fire alarm system must annunciate all alarms, diagnostics, and system conditions and status by type and specific location through text and graphics at the fire alarm control panel and associated annunciator, station agent's booth, the CCF, and the local emergency responder station.

Fire alarm devices, initiating devices, notification appliances, and signaling line circuits must be designated as Class A, as defined in NFPA 72, section 3-4. All initiating circuits, control circuits, and indicating circuits must be independently supervised for opens, shorts, and grounds that impair the functioning of the system. The system must operate fully through a short-circuit condition. No alarm or trouble signals can be lost when the system is operating in the shorted mode or any system loop. The abnormal status must be separately and distinctly annunciated at the fire alarm control panel and the CCF.

Where circuits leave the ancillary rooms, additional transient protection must be provided for each circuit. Devices must be UL-listed.

The fire alarm system must be electrically supervised and connected to the emergency power source so that loss of the station's primary power will not cause a loss of alarm capability.

15.3.2 Fire Alarm Device Requirements

Locations and installation requirements for all fire alarm devices must conform to NFPA 130, the CBC, and the local jurisdiction's fire ordinances and regulations.

Fire Alarm Control Panel

Fire alarm control panels must be located as follows:

- Near the point of surface entry by emergency responders, with specific locations agreed to with the fire department
- In the following secure areas: the OCC, each fire command post, each ventilation structure, each emergency egress structure, and each traction power substation

Fire alarm control panels must indicate, by audible and visual alarm, the activation and location of any fire signal generated within the DTX facilities. Fire alarm control panels must also indicate fire system supervisory signals and a fire alarm control panel trouble signal.

Fire alarm control panels must be lockable, red in color, and meet the following requirements:

- The fire alarm control panel at each location must interface with manual alarm pull stations, smoke and heat detectors, sprinkler water flow switches, standpipe flow switches, bells, horns, strobe lights, and all other detection systems provided at each location.
- All fire alarm control panels must be interconnected.
- A signal from the fire alarm control panel must trigger a tone generator to initiate public address system announcements directing passengers to evacuate.
- Fire alarm control panels must provide operating power for the initiating, indicating, and annunciation devices that are connected to the fire alarm control panel.
- Each fire alarm control panel must control systems including:
  - Air handling and emergency ventilation systems
  - Elevator recall
  - Emergency shut-off for power supplies
  - Automatic fire detection devices
  - Automatic sprinkler systems
  - Station deluge system

A permanent map of the facility served by the protective signaling system must be mounted next to the fire alarm control panel. The map must show the locations of shutoff controls for fire suppression and domestic water systems, gas, and electricity. The map must also show the locations of fire alarm zones, emergency exits, and hose cabinets. The map must be made of durable materials to withstand the environment and handling to which it will be exposed.

Automatic Fire Detection Devices

Automatic fire detection devices must be installed in the public areas of the Fourth and Townsend Street Station, the station at the Transit Center (where not already installed during Phase 1), all train control and communication equipment rooms, electrical equipment rooms, and traction power facilities. Where environmental conditions are such that smoke detectors are not suitable, heat detectors must be used. Where smoke detectors or heat detectors are used, design coverage must conform to NFPA 72.

Automatic fire detection devices (products of combustion detectors) must be installed in the following locations:

- Train control and communication equipment rooms (if located next to the station)
- Traction power facilities (if located next to the station)
- Electrical equipment rooms
- Storage rooms
- Building maintenance rooms
- Ventilation ducts

- Elevator hoistway entrances
- Concessionary kiosks that are not equipped with sprinklers
- Escalator and elevator machine rooms

Smoke Detectors. Smoke detectors must continually monitor changes in sensitivity resulting from the environmental effects of dirt, dust, smoke, temperature, and humidity and be activated by the presence of combustion products.

Smoke detectors must be addressable ionization detectors of the double-chamber type with adjustable sensitivity. The first or reference chamber must compensate against sensitivity changes caused by variations in temperature, barometric pressure, and humidity. The second or sensing chamber must be open to the outside elements through a protective screen that permits products of combustion to enter, while preventing insects and foreign matter from entering and causing false alarms. The ionizing material for detection and the reference chamber must be Americium 241.

The detector mounting base must be the twist/lock type with screw terminals.

Heat Detectors. Heat detectors must be the addressable, rate compensation type and factory-calibrated for a set point of 190°F.

Air Duct Detectors. Air duct detectors must operate on a cross-sectional air sampling principle. Remote test stations must be provided for duct smoke detectors. Remote test stations must be in a locked cabinet or controlled by key-activated switches as close as possible to the duct detector location.

Manual Fire Alarm Pull Stations

Manual pull stations must be provided throughout passenger platforms and stations in conformance with the requirements of NFPA 72 and NFPA 130.

Manual pull stations must be located in the free and paid areas of each train station within sight lines of the primary station agent's booth. The TJPA and the SFFD must approve the location of all other manual pull stations.

Manual pull stations must

- be red in color.
- be manually operated by pulling down on a lever that is exposed and readily accessed.
- have tamperproof covers.
- be housed in waterproof boxes if located outside or exposed to weather conditions.
- have closed-circuit television coverage for pull stations in public areas or boxes with integrated cameras.
- upon activation, signal an alarm in the station agent's booth and the CCF.
- upon activation, sound audible and visual alarms throughout the station.

Activation of a manual pull station must automatically trigger the repeated broadcast of a prerecorded announcement over the PAS of the affected train station warning passengers that all escalators will stop

within 90 seconds and instructing passengers on escalators to take hold of the escalator handrail. The announcement must be preceded by chimes and broadcast in, at a minimum, English, Spanish, and Chinese.

All escalators in the station must automatically come to a full stop 90 seconds after activation of the manual pull station.

All elevators in the station must automatically go to a pre-determined floor within 90 seconds after activation of the manual pull station. The elevators must be coordinated with the fire department to allow override control. Station platforms must have emergency waiting area or areas for mobility-impaired passengers to wait for fire department to assist with evacuation. The designer must demonstrate the tenability of emergency waiting area for a period of no less than the required duration of tenability as determined by the fire department.

Audible and Visual Indicators

Audible indicators must provide 90 dB at 10 feet from the device and conform to NFPA 72.

Visual signal indicators must be the strobe-type with a minimum intensity of 750 foot-candles. When installed in corridors, visual signal indicators must be equipped with a side viewing lens.

15.4 Fire Suppression Systems

15.4.1 Standpipe

The tunnel including, the Fourth and Townsend Street Station, must be equipped with Class I standpipes meeting the following criteria. A standpipe is required to

- be installed at each end of each platform.
- be manual wet type, connected to the City of San Francisco water supply.
- have a minimum inside diameter must be 4 inches.
- be hydraulically sized to provide 500 gpm for the most hydraulically remote standpipe, and 250 gpm for each additional standpipe.
- supply a minimum pressure of 75 pounds psi at the hose valve outlets with the maximum pressure of 150 psi supplied at the inlets by the SFFD. Where SFFD pumpers cannot supply the required system demand through an SFFD connection, an auxiliary water supply consisting of high-level water storage with additional pumping equipment or other means acceptable to the authority having jurisdiction must be provided.
- have SFFD connections be located not less than 18 inches or more than 48 inches above the level of the adjoining ground.
- have outlets will be located at 200-foot centers along the DTX alignment, corresponding with blue light station locations. The centerline of the outlet valve will be located at a height of 42 inches above the finished floor wherever practicable. However, where this criterion cannot be met, outlet valves must be located not less than 3 feet or more than 5 feet above the floor.
- have outlet valves will be placed to provide a minimum clearance of 6 inches on all sides of the handle and 18 inches on all sides of the threaded outlet.

- place connections and outlets so that doors or walls do not interfere with the use of the outlet valve.
- have outlet valves discharge horizontally.
- have SFFD connections and outlet valves 3-inch National Standard hose threads.
- not embed fire suppression system piping.

Fire hose cabinets will be provided on platforms, as required by the SFFD.

15.4.2 Automatic Sprinkler System

Sprinkler systems must be provided in all rooms and areas of the Fourth and Townsend Street Station, egress shafts, and ventilation buildings except for rooms containing sensitive electronic equipment. The requirements for sprinklers in ancillary structures must be approved by the TJPA and SFFD. Do not embed fire suppression system piping.

Sprinkler system design must conform to the requirements of NFPA 13 for spaces classified as ordinary hazard, Group 1.

15.4.3 Station Deluge System

An under-vehicle deluge system must be provided for each platform track in the Fourth and Townsend Street Station and the Transit Center. Design and installation of the deluge system must conform to the requirements of the CBC.

The deluge system must be interconnected with the overhead contact system (OCS) such that the OCS will be de-energized prior to activation.

15.4.4 Alternative Automatic Fire-Extinguishing System

A water mist fire extinguishing system conforming to NFPA 750 must be provided for rooms containing sensitive electronic equipment, such as train control equipment, communications equipment, and UPS equipment.

15.4.5 Fire Extinguishers

Ancillary rooms must be provided with fire extinguishers in conformance with NFPA 10.

15.5 Firefighters Air System

An air replenishment system must be provided to enable firefighters to refill air bottles for self-contained breathing apparatuses. The replenishment system must include a piping distribution system that conforms to the requirements of SFFD Administrative Bulletin 5.07, Air Replenishment Systems.

15.6 Blue Light Station

Blue light stations must be provided at maximum 200-foot centers throughout the tunnel. Station locations must be marked by a blue light fixture and include information signage that identifies the location of the station and the distance to an exit in each direction.

Each blue light station must have a unique identification number, marked in a prominent manner on a readily accessible, protective enclosure and annunciated at the CCF. Each enclosure must contain the following equipment:

- Tunnel emergency intercom
- Fire telephone jack box
- Fire extinguisher Type 20A:120B:C, with marine-type clamps
- Standpipe outlet valves (blue light stations in underground sections only)
- 120-V duplex convenience electrical outlet. See CHAPTER 17, Electrical Systems for electrical requirements

Blue light stations will be monitored by closed-circuit television. See CHAPTER 18, Rail Systems, for electrical requirements at blue light stations. See CHAPTER 19, Communications, for closed-circuit television system requirements.

15.7 Tunnel Egress

The design of tunnel egress facilities must conform to the requirements of NFPA 130, unless otherwise stated herein.

15.7.1 Walkways

Walkways must be provided next to each track in the tunnel as a means for passengers to evacuate the guideway to reach a point of safety. Walkways must

- have a minimum width of 2 feet 6 inches.
- maintain an unobstructed clear height of 6 feet 8 inches over the width of the walkway.
- be elevated 8 inches above top of rail unless the walkway is in between tracks.
- have walking surfaces with a uniform slip-resistant design.
- have handrails that do not obstruct egress from trains and are located opposite of the track adjacent to the tunnel wall.
- include signage at regular intervals that indicates the emergency egress direction and distances to the nearest exits in both directions and clearly identified cross-passageway doors in portions of tunnel with a partition wall.

The Transit Center station must include crosswalks between the center track walkways and the side walkways at a maximum of 400-foot centers and at the following locations:

- Where wayside equipment, signal boxes, and other obstructions interrupt the continuity of the crosswalk
- Each side of track crossovers
- At the ends of the side walkways to connect with the station platforms

No crosswalks will be provided in the Fourth and Townsend Street Station.

15.7.2 Points of Egress

Egress from the tunnel must be by means of fire-resistive enclosed passageways and stairways leading to exits at the surface. Points of egress must be located such that the maximum distance between exits does not exceed 2,500 feet. All egress points must be identified with illuminated signage.

Doors and hatches must conform to NFPA 130, the CBC, and the San Francisco Building Code.

The fire rating for exit stairs and doors must conform to Chapter 7 of NFPA 101, except where modified by NFPA 130 section 6.3.3.10.

15.8 Underground Stations

15.8.1 Occupant Load

The occupant load for the Fourth and Townsend Street and Transit Center stations must conform to NFPA 130 and the CBC. The occupant load must be based on an emergency condition requiring the evacuation of train and station occupants to a point of safety. Occupant load will be based on the methodology in NFPA 130, section 5,
using crush-load vehicle weight.

15.8.2 Number and Capacity of Exits

The number and capacity of egress routes must be sufficient to allow evacuation of the station platforms in 4 minutes or less and evacuation from the most remote point on the platform to a point of safety in 6 minutes or less. The maximum travel distance to a point of egress from any point on the platform must not exceed 300 feet. A common path of travel from the platform ends must not exceed 75 feet or one car length, whichever is greater.

Exiting calculations must conform to NFPA 130, using egress capacity in person-per-inch-per-minute and passenger travel speed in feet-per-minute, determined to conform to the most stringent of the requirements of NFPA 130 and the CBC.

CHAPTER 16 MECHANICAL SYSTEMS

This chapter establishes the requirements for mechanical systems for tunnel ventilation, heating and air conditioning, and plumbing and drainage for the Downtown Rail Extension (DTX) tunnel, Transit Center train box fit-out, Fourth and Townsend Street Station, ventilation and egress structures, and ancillary structures.

CODES, STANDARDS AND GUIDELINES

The design of mechanical systems for the DTX must conform to the latest edition of the following standards, codes, and guidelines govern unless otherwise specified in these criteria:

- American National Standards Institute/ American Iron and Steel Institute (ANSI/AISI)
- ASTM International standards:
  - ASTM A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - ASTM G90, Standard Practice for Performing Accelerated Outdoor Weathering of Materials Using Concentrated Natural Sunlight
- American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE) standards:
  - ASHRAE Handbook – Fundamentals
  - ASHRAE Standard 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
  - ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings
  - ASHRAE Standard 169, Climatic Data for Building Design Standards, Addendum A
- Air Movement and Control Association (AMCA) standards
- American National Standards Institute (ANSI)
- California Building Code (CBC)
- California Energy Code
- California High-Speed Rail Authority (CHSRA) Design Criteria Manual
- Caltrain Engineering Standards
- City and County of San Francisco (City) Municipal Code; San Francisco Plumbing Code
- Threat and Vulnerability Assessment for the Transbay Program. 2022. Prepared by AECOM for the Transbay Joint Powers Authority.
- National Fire Protection Association (NFPA)
  - NFPA 70, National Electrical Code (NEC)
  - NFPA 90A, Standard for Installation of Air-Conditioning and Ventilation Systems
  - NFPA 92, Standard for Smoke Controls Systems
  - NFPA 92A, Standard for Smoke Control Systems Utilizing Barriers and Pressure Differences
  - NFPA 101, Life Safety Code
  - NFPA 101A, Guide on Alternate Approaches to Life Safety

  - NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems
  - NFPA 204, Standard for Smoke and Heat Venting
  - NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials
  - NFPA 502, Standard for Road Tunnels, Bridges, and Other Limited Access Highways
- Occupational Safety and Health Administration (OSHA) guidelines
- San Francisco Municipal Transportation Agency (SFMTA) - Central Subway Design Criteria
- San Francisco Public Utilities Commission regulations
- Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- Underwriters Laboratories (UL)

16.1 Tunnel Ventilation

The DTX tunnel ventilation system comprises reversible ventilation fans, dampers, sound attenuators, flexible connectors, and ducted connections between the tunnel and openings at or above grade.

Tunnel ventilation system design must consider three operating conditions: normal, congested, and emergency, as defined in the following sections.

16.1.1 Normal Operations

During normal operations, trains move in the tunnel according to schedule, and the flow of passengers is unobstructed. The ventilation system controls tunnel air temperature, tunnel air velocity, and tunnel air pressure change rates.

The ventilation system under normal conditions must dissipate heat generated by trains during peak-hour activity by exchanging system air with outside air. Air exchange must be accomplished through the piston effect of trains moving through the tunnel, supplemented by mechanical ventilation, as necessary. Ambient air temperatures in the tunnel must be managed.

16.1.2 Congested Operations

During congested operations, the movement of trains is impeded, trains are stationary in the tunnel, or the flow of passengers to and from the station platforms is obstructed. During congested conditions, the ventilation system must control air temperature, air velocity, and air pressure change rates in the tunnel.

The ventilation system under congested conditions must dissipate heat generated by stopped trains, including heat given off by vehicle air-conditioning systems and the residual heat emanating from the train propulsion system. Air exchange must be accomplished by a mechanical ventilation system. Ambient air temperatures must not exceed the conditions for summer peak design.

The ventilation design for congested operations must consider non-incident trains within adjacent affected tunnel ventilation zones. The heat emitted from multiple stopped trains will result in higher air temperatures in the tunnel than the heat emitted by a single stopped train, which necessitates greater overall airflow requirements.

If congested conditions necessitate train evacuation, the fan speed must be set to maintain a tenable environment in conformance with NFPA 130 conditions, consistent with emergency operations. See subsection 16.1.3.

16.1.3 Fire Emergency Operations

Fire emergency operations are triggered by a fire incident within the tunnel. During fire emergency operations, passengers will be evacuated from the incident train, and the ventilation system will control tunnel air temperature, tunnel air velocity, and the direction of smoke movement. Other trains may be stationary in the tunnel. The design and operation of the tunnel ventilation system must be coordinated with the signaling system and traction power blocks to conform to NFPA 130.

The ventilation system must maintain a single egress path that leads from the incident train and is clear of smoke and hot gases to promote safe egress and facilitate firefighting operations.

The ventilation system must be capable of moving air in either direction across the train at the required air velocity to maintain a smoke-free path. The design must consider the effect of non-incident trains within adjacent tunnel ventilation zones on the required air velocity.

The emergency ventilation system must be reviewed by the Transbay Joint Powers Authority's subject matter expert.

Detailed computer simulation studies must be undertaken to evaluate the performance of the tunnel ventilation system, including tunnel air temperature and tunnel air velocity, for each of the operating conditions.

A control mode table for damper and fan operations covering each tunnel ventilation zone in the system under each operating condition must be developed.

NFPA 130 provides guidance on tenability criteria. The required time of tenability must be developed for each station and follow guidance from the SFFD and first responders as well as an emergency response plan.

If single extract mode is anticipated in a particular location, additional discussion and description of this mode will be added.

16.1.4 Maintenance and Train Recovery Operations

Maintenance and train recovery operations are expected to be performed using diesel-powered equipment. An operations procedure will be written and approved by the operators. The ventilation system must be used during any operations involving the use of diesel equipment in the DTX tunnel. The designer must develop a ventilation system sequence of operation and mode tables and must verify the adequacy of the tunnel ventilation for this purpose.

16.1.5 Environment Design Conditions

Outside Conditions

Use the following outside ambient conditions in the computer analysis for determining the required capacity of the ventilation system for normal and congested operations:

- Extreme summer dry bulb temperature 109°F
- Summer dry bulb temperature 83°F
- Summer mean coincident wet bulb 63°F
- Winter dry bulb temperature 37°F
- Extreme winter dry bulb temperature 28°F

Indoor Design Conditions for Normal Operations

Air Temperature. The maximum air temperature in the tunnel must not exceed 105°F.

Heating. Heating will not be provided in the tunnel. Sub-freezing temperatures may occur in the tunnel during extreme winter design conditions.

Humidity. Do not provide dehumidification.

Air Velocity. Air velocity control will not be provided during off-service hours.

Air Pressure Transients. The criterion for rapid pressure changes, applicable when the total change in pressure is greater than 0.10 psi (2.8 inches water gauge per second), is that no person (neither patron nor employee) will be subjected to a rate of pressure change greater than 0.06 psi per second (1.7 inches water gauge per second).

Emergency Operations

Emergency ventilation system design must meet the following requirements:

Train Fire Heat Release Rate. The design train fire size and growth rate must conform to the fire sizes indicated in the Transbay Program's Threat and Vulnerability Assessment.

Evacuation Route Air Temperature. The maximum temperature will not exceed 140°F (ignoring radiant heating) for momentary exposures. The average air temperature in the evacuation route will not exceed 120°F for the first six minutes of the exposure.

Evacuation Route Air Velocity. The minimum air velocity will not be less than that required to control the spread of smoke and hot gases from the fire into the evacuation path. The maximum air velocity in the evacuation path must not exceed 2,200 fpm. The designer must calculate the critical air velocity required to prevent backlayering using approved methods.

Single Point Extraction. Single point extraction must conform to NFPA 130, section 7.2.2 – Single Point Extraction.

Design Air Velocities

Design air velocities must meet the system performance requirements and minimize pressure loss and energy consumption, airborne noise generation, draft, and the intake of dust particles. The design velocities in air distribution systems are as follows:

Shafts and Ducts. The average air velocity in the tunnel ventilation shafts and ducts must not exceed a maximum of 2,000 fpm.

Fan Dampers. The air velocity across the tunnel ventilation dampers must not exceed a maximum of 2,000 fpm over the gross face area.

Plenum Areas. The average air velocity in tunnel ventilation plenum areas must not exceed a maximum of 2,000 fpm.

Fan Sound Attenuators. The air velocity through the fan sound attenuators must not exceed a maximum of 2,000 fpm over the gross face area.

Outside Air Intakes 10 feet or More Above Grade or Away from Public Areas. The face area of grating must be sized for a maximum air velocity of 1,500 fpm.

Exhaust Air 10 feet or More Above Sidewalk Level, or Away from Public Areas. The face area of grating must be sized for a maximum air velocity of 1,500 fpm.

16.1.6 System Equipment and Arrangement

All system components located in the air stream (including fans, fan motors, dampers and damper actuators) must be capable of operating in an air stream temperature of 482°F, for a minimum of one hour.

Fans

Fans must be housed in fan rooms, in shafts, or, in the case of jet fans, within the tunnel cross section and must be arranged either horizontally or vertically. Fan dampers and bypass dampers must be provided in the structure separating the fan room from the tunnel.

Fan motor starters and related operating control devices must be isolated from the ventilation airflow by a physical separation having a fire resistance rating of two hours or more.

Axial Flow Fans. Axial flow fans must

- have an internally mounted, direct drive motor.
- achieve their full operating speed from a stopped position in no more than 30 seconds and will be reversible, from full supply to full exhaust or vice versa, within 60 seconds.
- have manually adjustable pitch blades.
- have equipment that includes inlet and outlet transition pieces and flexible connectors. The minimum acceptable reverse (supply) airflow capacity must be 100 percent of the forward (exhaust) airflow capacity.
- have a total fan efficiency of not less than 65 percent in the forward (exhaust) mode.

- have motor units with a capacity range of 150,000 cubic feet per minute (cfm) to 250,000 cfm and operate in the stable range of the fan performance curve through the entire operating pressure range.
- have motors with sealed motor bearings.
- have modular, rectangular sound attenuators on both inlet and discharge sides. The length of the sound attenuators will be based on the dynamic insertion loss levels required to meet the applicable noise criteria.

Fans may be controlled by single, double, or variable speed drives.

Jet Fans. Jet fans must

- be of the axial flow type with an internally mounted direct drive motor.
- achieve their full operating speed from a stopped position in no more than 30 seconds; they must be reversible to go from fully forward to fully reversed or vice versa within 60 seconds.
- be capable of providing specified exit velocity and static thrust in either direction of operation.
- have power requirements for the reverse direction that do not exceed power requirements of the forward direction.
- have manually adjustable fixed pitch blades.
- Have an efficiency of not less than 60 percent when operating in the forward direction of airflow at the specified nominal static thrust and exit velocity.
- have cylindrical (tubular) sound attenuators directly mounted in the end of the fan. Attenuator length will be selected to ensure the tunnel noise criteria are not exceeded. The minimum attenuator length will be the equivalent of one fan diameter.
- be supplied with a support and suspension system to provide support as required against fluctuating loads imposed by fan operation and moving traffic.
- have an assembly that operates under and resists the effects of water spray washing.
- be designed to run to destruction when during emergency operations.

Dampers

Isolation dampers must prevent airflow through the tunnel ventilation fans when the fans are not running.

In their closed position, fan and bypass dampers must provide the equivalent of a two-hour fire resistance rating. Where necessary during normal operations, bypass shafts must allow air exchange between the outside ambient and the tunnel. Bypass dampers must be provided to prevent the short-circuiting of airflow around the bypass shaft during fan operations. Bypass dampers must be located nearest to the ventilation shafts extending to grade.

Isolation dampers, bypass dampers, and fan dampers must

- be the heavy duty, industrial, parallel-blade type.
- be capable, along with their associated structural supporting members, of withstanding a maximum differential static pressure across the dampers of 14 inches water gauge, and minimum differential static pressure of 4 inches water gauge for 2,000,000 reversals.

- not leak more than 5 percent of the design airflow.
- not take longer than 30 seconds to operate from fully open to fully closed (or vice versa).
- have a predetermined position upon which to return following power loss or actuator failure.

Sheet Metal Ducts

Sheet metal ducts must

- be constructed of galvanized steel with airtight joints. The measured leakage must not exceed 5 percent of the design airflow.
- be sufficiently stiffened and supported to avoid sagging and vibration. Ductwork fabrication must conform to the Sheet-Metal And Air Conditioning Contractors National Association (SMACNA) pressure classifications to be specified for each system.
- have sufficient thermal insulation to limit the exposed surface temperature to 120°F, if the ducts are intended to operate at air temperatures exceeding 120°F.

Shafts

Shaft design must

- avoid abrupt transitions in the shaft cross-section.
- minimize the number of bends and elbows. Turning vanes may be used to reduce pressure losses.
- have air passages constructed of smooth concrete or sheet metal ductwork.
- locate outside air exhaust/intake openings 10 feet (minimum) from lot lines or buildings on the same lot. Where outside air openings front on a street or public way, the distance from the opening will be measured to the centerline of the street or public way.
- protect with corrosion-resistant screens all exhaust/intake openings that terminate outdoors.

Equipment Access and Handling

The design must provide for the installation, maintenance, and subsequent removal/replacement of ventilation equipment as follows:

- All openings, shafts, doors, hatches must be sized with adequate clearances such that equipment can be installed or removed without disassembly or special construction or demolition.
- Monorails, lifting hooks, and removable panels must be incorporated into the design, as necessary, to facilitate the installation and removal of equipment.

Emergency Exit Pressurization System

Emergency exits from the tunnel must house a dedicated mechanical ventilation system capable of maintaining a smoke-free environment during a fire incident. Emergency exit ventilation systems must meet the following requirements:

- Emergency exit spaces must be maintained at a minimum pressure of 0.14-inch water gauge above the pressure within the tunnel. The maximum pressure within the emergency exit must be the lesser

of 0.3-inch water gauge or the pressure required to permit the trackside door to be opened with a maximum force of 50 pounds.

- Emergency exit space pressure must be maintained with all doors closed.
- Air supply used for pressurization must be drawn directly from an outside air shaft or louvers. The transfer of air from other spaces is not permitted.
- Supply ductwork must be contained within fire-rated enclosures or be fabricated from fire-rated ductwork prior to passing into the emergency exit.
- Fan operation indication must be provided to the Transit Center Security Operations Center and Caltrain's Central Control Facility (CCF).

16.1.7 Control and Monitoring

The operation of the tunnel ventilation system must be controlled remotely from the CCF by means of the supervisory control and data acquisition (SCADA) system. The SCADA system will continuously monitor the status of the fans, motors, dampers, motor controllers, and other related systems, including alarms.

Tunnel ventilation system reliability requirements must conform to NFPA 130 sections 7.2.3 (6) and 7.2.4; they must also include provisions for local operation.

Fan Motor Controllers

The tunnel ventilation fan system will be fed from a redundant power supply. Fan motor controllers must be provided with dedicated feeders from two separate and distinct power sources. Starters for tunnel ventilation fans must

- be 480-volt, variable frequency drive type, multispeed, reversible, with motor circuit protectors.
- be located in electrical equipment rooms that are environmentally controlled and protected from unauthorized entry and suitable for the environment in which they are installed.
- have heavy-duty disconnect switches must be provided as a means to disconnect equipment from its feeder when the equipment is not within sight of the feeder breaker or the motor controller.
- have damper motor controllers located within damper control panels that are adjacent to the fan motor starters. The DCP will provide the means for both remote and local operation and testing of the dampers.
- have overcurrent elements used to protect conductors serving emergency equipment motors (e.g., fans, dampers) that are to be located in spaces other than main electrical distribution rooms.
- have overcurrent elements that are the magnetic type and do not depend on thermal properties for operation.

Control Panels

A ventilation control panel (VCP) must be provided in a dedicated local control room. The VCP must duplicate the essential remote control and monitoring capability of the supervisory control and data acquisition (SCADA) system for the tunnel ventilation system only and serve as a standby if controlling the ventilation

system from outside of the SCADA system becomes necessary. The VCP must also provide the capability for local, maintenance-related equipment testing operations.

A local control panel (LCP) must be provided in each ventilation plant to allow control of the ventilation equipment at that location only. The LCP must be controllable by emergency response personnel during a tunnel fire incident. The VCPs must not be exposed to the tunnel environment during emergency vent operations.

Control and Communication

Dual redundant programmable logic controllers (PLCs) and dual communications to the SCADA system, the ventilation control panel, and local control panel must provide a high-availability system. The PLCs will receive mode commands from the SCADA system, VCP, or LCP and will sequence the ventilation plant by means of the damper control panels and fan motor controllers to control the dampers and fans. The PLCs will continually relay the status of the tunnel ventilation system to the supervisory control levels. The status must include the number and identification of operating fans and the position (open or closed) of each damper.

The source of control must be in the following order: (1) SCADA system, (2) ventilation control panel, and (3) local control panel. A hand down of control between the SCADA system, the VCP, and the LCP must be implemented to ensure that control conflicts do not occur. Control must be accomplished through the selection of an appropriate mode, with the mode representing a predefined ventilation response for normal, congested, and emergency conditions. During testing and maintenance, the fans and dampers must also be controllable individually from their respective motor controllers and DCP controls, located in close proximity to the fan rooms.

16.1.8 Emergency System Operation

During emergency operations, fan start logic must conform to NFPA 130.

During emergency operations, the tunnel ventilation fans must achieve full operational mode within three minutes of activation. The local control system for the tunnel ventilation system will receive control commands from the SCADA system (or VCP) to control the ventilation system components and report equipment status, including operation alarms, to the SCADA system. The local control system must include an operational link with the local fire alarm control panel.

Control and Monitoring

The SCADA system will provide the CCF workstation with

- local fan control indication.
- alarm screens and alarm log, e.g., high temperature, equipment fault/failure.
- recording of total energy consumption and operating hours for all ventilation equipment.
- program maintenance guides.
- confirmation of control level responsibility (remote or local).
- ventilation operator interface using a color graphic schematic of the ventilation system. During emergency conditions, the SCADA software must provide decision support to the operator to assist in the selection of the appropriate mode. The schematic will be dynamically updated with damper

and fan status. A real time database will provide centralized logging of selected ventilation equipment and automatically generate standard periodic reports, including daily, weekly and monthly reports.

SCADA Functions

The SCADA system must be able to initiate operation of the tunnel ventilation system

- by means of the DTX Control System in response to congested train operations resulting from a delay or operational problems.
- by means of the DTX Control System during or in preparation for normal train operations, if necessary.
- in response to an emergency condition. The SCADA system will enable the DTX Control System to quickly activate the appropriate operation mode to direct smoke away from the designated evacuation path. Indicate the local fan control.

Programmable Logic Controller Functions

The PLCs must be able to:

Receive

- and send data to the SCADA system.
- commands from the SCADA system and start the equipment sequentially, with adjustable preset time delays, to avoid excessive surge on the power supply system.
- digital status such as the on/off or alarm status of equipment to directly control the starting and stopping of fans and the opening and closing of associated dampers.
- analog signals in the form of voltage or current from field sensors; convert these signals into engineering units and report them to the SCADA system.
- set-point information from the SCADA system or p/m terminals and retain these values in memory for control reference and function.
- mode commands from the SCADA system and operate fans and dampers in a preset configuration, with insertion of time delays and interlocking logic.

Monitor

- the status and alarm indications of all ventilation equipment and provide automatic changeover to available standby or idling equipment.
- the status and alarm indications of ventilation equipment and report any change of status to the SCADA system and the programming and maintenance terminals.
- the activation of the push buttons or switches on the LCP and execute priority control.

Output

- analog signals in the form of voltage or current to the transducers in the control device panel of the equipment where they are converted into suitable signals to drive actuators or other control devices.

Log and report

- alarms of analog signals that have exceeded preset high, low, or rate-of-change limits.

16.2 Heating, Ventilation and Air Conditioning System

Heating, ventilation, and air conditioning (HVAC) design, where applicable, for the Transit Center train box fit-out and Fourth and Townsend Street Station, ventilation buildings, and ancillary structures must conform to the requirements in this section.

16.2.1 Environment Design Conditions

Outdoor Conditions

Underground station platform, ancillary areas, and other systems using 100 percent outside air (based on ASHRAE Standard 169, 0.4 percent summer and 99.6 percent winter annual conditions in San Francisco).

Summer dry bulb temperature	83°F
Summer mean coincident wet bulb	63°F
Winter dry bulb temperature	40°F

Indoor Conditions for Normal Operations

Space design conditions and requirements – Hold for future input.

16.2.2 Minimum Ventilation Requirements

Ventilation of the DTX facilities must conform to the following minimum requirements:

Platform	15 cfm/person
Mezzanine circulation areas	15 cfm/person
Service and ancillary areas	As required by local code

The concourse and platform at the Fourth and Townsend Street Station must be naturally ventilated using the following requirements from San Francisco Municipal Transportation Agency's criteria for the Central Subway project:

- Maximum temperature is 10 degrees above ambient temperature
- No heating is required

Air Supply

Spot cooling on platforms must have a maximum air terminal velocity (measured at 5 ft 6 inches above floor) of 30 to 50 fpm.

Design Velocities for Air-Distribution Systems

Design velocities must meet the required system performance and minimize airborne noise generation, draft, and the intake of dust particles. Use the following design guidelines for maximum velocities in air-distribution systems under normal operation:

Table 16-1: Sheet-metal Ducts

Distribution Ducts	Preferred Maximum	Absolute Maximum (Where site limits do not allow preferred maximum)
Main supply ducts	1,800 fpm	2500 fpm
Branch supply ducts	1,500 fpm	2500 fpm
Outside air intake ducts	1,500 fpm	2500 fpm
Main exhaust and return ducts	1,800 fpm	2500 fpm
Branch exhaust and return ducts	1,200 fpm	2500 fpm
Transfer ducts	350 fpm	N/A

Concrete Ducts and Plenums. Base velocities on the circular equivalent of the rectangular duct.

Air Outlets and Intakes

- Street intake louvers: 500 fpm over gross area
- Street intake grilles: 1,200 fpm over gross area
- Street exhaust louvers: 700 fpm over gross area
- Street exhaust grilles: 1,500 fpm over gross area
- Room exhaust and return grilles: 500 fpm over gross area
- Room supply registers and grilles: To be selected based upon the required throw and noise requirements for each space

Design Velocities for Ventilation Shafts

The maximum air velocity through a grating, louver, or grille will be computed using the gross face area of the grille or louver, exclusive of any support. Use the following air velocity design guidelines under normal and emergency operations:

Velocities through Horizontal Openings (Normal Operation)

- Outside air intakes 10 feet or more above grade level or away from a public area: 1,200 fpm
- Exhaust air 10 feet or more above sidewalk level or away from a public area: 1,000 fpm

Velocities through Vertical Louvers and Grilles (Normal Operation)

- Outside air intakes 10 feet above sidewalk level (ASHRAE Handbook - Fundamentals): Recommended 500 fpm, maximum 1,200 fpm
- Exhaust air 10 feet above sidewalk level: Recommended 500 fpm, maximum 1,000 fpm

Velocities through Vertical Louvers and Grilles (Emergency Operation)

- Exhaust air 10 feet above sidewalk level: 1,500 fpm
- Velocities for main ventilation shafts: (Emergency Operation); listed velocity may be increased up to 25 percent:
  - 2,000 fpm (preferred)
  - 2,500 fpm (maximum)

16.2.3 Shaft Design

HVAC shaft design must conform to the requirements of subsection 16.1.5, Environmental Design Conditions/Design Air Velocities.

16.2.4 Public Area HVAC Systems

Subsections Ventilation System Operation, and Ventilation System Operation, describe the HVAC requirements in public areas of the Transit Center train box fit-out and Fourth and Townsend Street Station.

Ventilation System Operation

Platforms. The supply air system must supply and distribute ventilation air at platform ceiling level.

An exhaust system must capture heat emitted by passenger and maintenance vehicles during normal and congested operations and purge smoke during emergency operations. The captured heat and smoke must be vented to the atmosphere.

Concourse. The concourse supply air system must supply and distribute ventilation air at concourse ceiling level.

An exhaust system must capture heat and smoke during emergency operations. The captured heat and smoke must be vented to atmosphere.

HVAC Control and Monitoring System

LCPs will be provided at the platform and concourse levels. The panels will override remote control from the CCF and be used by personnel for testing and maintaining equipment and in the case of failure of the CCF.

Emergency Exit Air-Pressurization System

Station emergency exit stairwells and corridors must be pressurized as described in section 16.1.6.6.

16.2.5 Nonpublic Area HVAC Systems

This subsection addresses the design of HVAC systems serving non-public areas of the Fourth and Townsend Street Station, ventilation buildings, and ancillary spaces. Table 16-2 summarizes the requirements for individual rooms. The temperature of rooms containing sensitive equipment will be dictated by the equipment operating temperature limits. If rooms are cooled by ventilation, the design must account for extreme daily temperatures rather than outdoor design conditions.

Table 16-2: HVAC Requirements

Criteria Reference	Room Description	HVAC System Type	Air Change Rate
16.2.4.1			
	Battery	Hydrogen and temperature control	-
15.2.4.2			
	Fan	Air change and temperature control	2/hour
	Mechanical equipment	Air change and temperature control	2/hour
	Pump	Air change and temperature control	2/hour
16.2.4.3			
	Control	Ventilating and cooling	-
	General electrical services	Ventilation and cooling	-
16.2.4.4			
	Ventilation substation	Ventilation and temperature control (transformer rooms)	-
	Traction power substation	Ventilation and temperature control (transformer rooms)	-
16.2.4.5			
	Sewage ejector	Air change	10/hour
	Storage	Air change	2/hour
	Sump	Air change	10/hour
	Toilet	Air change	10/hour
	Trash	Air change	15/hour
	Valve	Air change	2/hour
16.2.4.6			
	Train control/communication	Pressurization and cooling	-
	Signal	Pressurization and cooling	-
16.2.4.7			
	Elevator machine	Temperature control	-
16.2.4.8			
	Staff (locker, lunch, meeting, offices)	Ventilation and cooling	4/hour (locker rooms only)

Hydrogen Concentration and Temperature Control Systems

Hydrogen concentration and temperature control systems must be provided in the following locations:

- Battery rooms
- Uninterruptible power supply rooms (as required by UPS equipment)

The system must limit the concentration of hydrogen gas within the space to 1 percent by volume and limit the temperature within the space to a maximum of 12°F above outdoor temperature.

A mechanical supply system must supply filtered 100 percent outside air or conditioned air from a public space, as applicable, to rooms located underground. If valve-regulated (sealed) batteries are used, calculate the hydrogen production using the same generation rates as standard lead acid batteries.

Exhaust air must be removed from a high level within the space and vented to the atmosphere.

Equipment. Hydrogen concentration and temperature control equipment consists of supply air and exhaust fans, filters, air-distribution ductwork and devices, air outlet dampers, room heaters, gas detection devices, warning lights, and automatic controls and must conforming to the following requirements:

- Supply system must be provided only in cases where air from adjacent spaces cannot be used.
- Battery rooms must have two supply and two exhaust fans. If one fan fails, the standby fan will operate. If multiple battery rooms exist at any location, a common system may serve all battery rooms.
- Exhaust fans must be spark-resistant with explosion-proof fan motors.
- Exhaust ducts and supply and exhaust grilles and registers within the battery rooms must be stainless steel or galvanized steel duct with inner epoxy layer.
- If required, additional wall- or ceiling-mounted unit heaters or electric duct-type heaters must be provided to maintain the room temperature to a minimum of 50°F. (The heat output of the equipment, except for the transformer, in the room will cannot be used to offset the space heat losses.)
- Room heaters must be spark-resistant with explosion-proof fan motors.
- Miscellaneous electrical devices located inside battery rooms must be explosion-proof.

Operation and Control. Hydrogen concentration and temperature control systems must be able to run continuously. An airflow switch located in the discharge duct of each fan system will monitor operation. A remote indication of fan operation must be provided to the CCF. An indication of no airflow must start the standby supply or exhaust fan and be transmitted to the CCF. Air outlet dampers on each fan must be sequenced to open when the fan is running and close when the fan is not running.

Battery rooms must have a hydrogen gas detection system that will send a warning to the CCF of the presence of hydrogen gas above 1 percent by volume within the room. The detection system must activate warning lights located both inside and immediately outside the affected room.

A dirty filter indicator must transmit a system fault indication to the CCF.

Air Change and Temperature Control Systems

The following rooms must have air change and temperature control systems:

- Fan rooms
- Mechanical equipment rooms
- Train control/communications rooms
- Pump rooms

Ventilation must be supplied entirely by filtered outside air. The required airflow must be the greater of the following:

- Airflow required to provide the air change rate listed in Table 16-2
- Airflow required to limit the room temperature to a maximum of 12°F above outdoor temperature

Equipment. Air change and temperature control equipment consists of supply air and exhaust fans, filters, air-distribution ductwork/devices, air outlet and inlet dampers, room heaters, and automatic controls.

Similar rooms may be served from a single-fan system, with individual ductwork connections to each room.

The heat output of the equipment cannot be used to offset the space heat losses. If required, additional wall- or ceiling-mounted unit heaters must maintain the room temperature to a minimum of 50°F.

Operation and Control. Air change and temperature control systems will be controlled by thermostats located within the rooms. A start/stop switch must be provided to allow manual control during maintenance. Where a system serves more than one space, operation of the entire system must be based on the dictates of the thermostat or manual start/stop switch in any single space.

An indication of fan operation must be transmitted to the CCF. A dirty filter indicator must transmit a system fault indication to the CCF.

Ventilation and Cooling System

Ventilation and cooling must be provided for the following rooms:

- Control rooms
- General electrical services rooms

Ventilation of the general electrical service rooms must be supplied entirely by filtered outside air.

The ventilation system design must specifically preclude recirculation. The airflow must be the greater of the airflow required to (a) limit the temperature within the room to a maximum of 12°F above outside air temperature or (b) pressurize the room to between 0.1-inch and 0.25-inch water gauge for space leading to the trackway.

Base the ventilation capacity required to control space temperature on a summation of the following internal heat gains:

- Lighting load
- Solar and transmission gains, where applicable
- Heat gain produced by equipment, calculated based on actual loads
- Occupants, where applicable (minimum 15 cfm per person)

Equipment. Ventilation and cooling system equipment consist of supply and exhaust air fans, filters, motorized dampers, ductwork and devices, air inlets and outlets, heaters, and automatic temperature controls and must meet the following requirements:

- Supply and exhaust fans must be electronically interlocked.

- Exhaust air must be vented to atmosphere.
- Single-supply air system must be provided for room pressurization for spaces leading to the trackway.
- If required, additional wall- or ceiling-mounted unit heaters must maintain the room temperature at a minimum of 50°F. The heat output of the equipment cannot be used to offset the space heat losses.

Similar rooms may be served from a single-fan system, with individual ductwork connections to each room.

Operation and Control. Ventilation and cooling systems must be controlled by thermostats located within the room. A start/stop switch must allow manual control during maintenance. Where a system serves more than one space, operation of the entire system must be based on the dictates of the thermostat or manual start/stop switch
in any single space.

An indication of fan operation must be transmitted to the CCF. A dirty filter indicator must transmit a system fault indication to the CCF.

Pressurization and Temperature Control System

Pressurization and temperature control must be provided for the following spaces:

- Traction power substations
- Tunnel ventilation fan transformer substations

Ventilation of substation rooms must be supplied entirely by filtered outside air.

The pressurization and temperature control system must ensure that the operating temperature within the space does not exceed 105°F, and that sufficient pressure is maintained to prevent rail dust, etc., from entering the substations and affecting electrical equipment operation.

Base the required ventilation capacity on a summation of the following internal heat gains:

- Lighting load
- Solar and transmission gains, where applicable
- Heat gain produced by equipment, calculated based on actual loads
- Occupants, where applicable (minimum 15 cfm per person)

Equipment. Pressurization and temperature control system equipment consists of supply and exhaust air fans, filters, motorized dampers ductwork and devices, air inlets and outlets, heaters, and automatic temperature controls and must meet the following requirements:

- Rooms must have a minimum of three identical exhaust fans. Two of the three exhaust fans together must be capable of meeting the ventilation requirement. The third exhaust fan will serve as a standby unit.
- Supply and exhaust fans must be electrically interlocked and must have a low-leakage damper to isolate the fan when not running.
- Exhaust air must be vented to atmosphere.

- Single-supply air system must provide for room pressurization for the spaces leading to trackway and above grade.
- If required, additional wall- or ceiling-mounted unit heaters must maintain the room temperature at a minimum of 50°F. With the exception of the transformer, the heat output of the equipment cannot be used to offset the space heat losses.

Operation and Control. Pressurization and temperature control systems must be controlled by a thermostat located within the space as follows:

- When the temperature of the space rises to 84°F, a single exhaust fan will start
- When the temperature continues to rise and reaches 104°F, a second fan will start
- When the temperature falls to 89°F, the second fan will stop
- When the temperature continues to fall and reaches 79°F, the first fan will stop

A local manual control must allow control of the ventilation system when the room is occupied by personnel.

An indication of fan operation must be transmitted to the CCF. A high-temperature thermostat (set at 110°F) and a dirty filter indicator each must transmit a system fault indication to the CCF.

Air Change Systems

Air changes systems must be provided for the following rooms:

- Sewage ejector rooms
- Storage rooms
- Sump rooms
- Restrooms
- Trash rooms
- Valve rooms

Exhaust air ventilation must provide the number of air changes specified in Table 16 1. Supply air must be drawn from an adjacent space through a transfer grille unless the adjacent space is either an emergency exit corridor or a pressurized space, in which case, a supply air system must be provided and sized to match the capacity of the exhaust air system.

Equipment . Air change systems consist of, as necessary, supply and exhaust air fans, filters, ductwork and devices, air inlets and outlets, heaters, and automatic temperature controls : Wall- or ceiling-mounted unit heaters must be provided in storage rooms and toilets to maintain the room temperature to a minimum of 50°F.Similar rooms may be served from a single-fan system, with individual ductwork connections to each room.

Operation and Control. Ventilation must operate continuously except when serving toilets. Ventilation controls in toilets must be interlocked with the room light switch.

An indication of fan operation must be transmitted to the CCF. A dirty filter indicator must transmit a system fault indication to the CCF.

Pressurization and Cooling Systems

Pressurization and cooling systems must be provided for the following rooms:

- Signal rooms
- Train control and communication rooms

Rooms must be provided with mechanical cooling, as required, to maintain a suitable environment for the operation of temperature- and humidity-sensitive equipment. Filtered ventilation air must be provided to maintain air quality for occupancy, where required.

Base the cooling load on a summation of the following heat gains:

- Heat gain produced by equipment
- Lighting load
- Pressurization ventilation requirement
- Solar and transmission gains, where applicable
- Occupancy, where applicable

Equipment. The pressurization and cooling system consists of an air conditioning system, supply air system, heaters, and an automatic temperature control that must meet the following requirements:

- Air conditioning equipment must be of the direct-expansion, fan-coil unit type.
- The air conditioning units must be located either in the room or in an adjacent mechanical equipment room. The air-cooled condenser may be a part of the air-conditioning unit or may be remote from it.
- Units must be provided with refrigerant R22 or its replacement and must fully recirculate room air and contain an integral return air filter.
- The supply air system must comprise a supply air fan, filter, coil, air-distribution ductwork and devices, and air inlet and outlets.
- Heating must be provided through wall- or ceiling-mounted unit heaters or incorporated into the packaged cooling units.

Operation and Control. A room thermostat (set point 78°F cooling/68°F heating) must maintain the room temperature at the thermostatic setting. Another room thermostat (set point 90°F) must transmit a high-temperature indication to the CCF. An indication of fan operation must be transmitted to the CCF.

The fan-coil unit air-conditioning system will automatically shut down in case fire or smoke is detected in the room.

Temperature Control Systems

Temperature control systems must be provided for elevator machine rooms.

Ventilation must be supplied entirely by filtered outside air. The airflow must limit the maximum temperature within the room to a maximum of 105°F.

The ventilation capacity required to control the space temperature will be based upon a summation of the following internal heat gains:

- Lighting load
- Solar and transmission gains, where applicable
- Heat gain produced by equipment in the equipment room calculated based on actual loads
- Occupants, where applicable

Equipment. Temperature and control systems consist of exhaust air fan, ductwork/devices, air outlet dampers, heaters, and automatic temperature controls.

Similar rooms may be served from a single-fan system, with individual ductwork connections to each room.

If required, additional wall- or ceiling-mounted unit heaters will be provided to maintain the room temperature to a minimum of 50°F. The heat output of the equipment in the space will not be used to offset the space heat losses.

Operation and Control. Ventilation systems will be controlled by a thermostat located in the space. Remote indication of fan operation will be provided to the CCF. A dirty filter indicator will transmit a system fault indication to the CCF.

Ventilation and Cooling Systems with Air Cooled Air-Conditioning

Ventilation and cooling systems with air-cooled air conditioning must be provided in areas with permanent or semi-permanent occupancy, including locker rooms, lunchrooms, meeting rooms, offices, and staff rooms.

Rooms must be provided with the filtered ventilation air and the mechanical cooling necessary to maintain a suitable environment for occupancy.

Minimum outside air ventilation requirements must conform to the CBC. Base the cooling load on a summation of the following heat gains:

- Heat gain produced by equipment
- Lighting load
- Ventilation requirement
- Solar and transmission gains, where applicable
- Occupancy

Equipment. Ventilation and cooling systems consist of an air conditioning system, supply air system, heaters, and automatic temperature control and must meet the following requirements:

- Equipment must be of the direct expansion, split system type.
- Air-conditioning units
  - must be located in either the room or an adjacent mechanical equipment room. The air-cooled condenser may be a part of the air-conditioning unit or remote from it.
  - must be fully recirculating and contain an integral return air filter.
  - must be provided with refrigerant R22 or its replacement.

- Supply air system must consist of a supply air fan, filter, air distribution ductwork and devices, air outlet damper, and automatic controls to provide the outside air sufficient for human occupancy.
- Economizer control must be considered for above-ground rooms if sufficient air intake louvers are available.

Conditional requirements include:

- Supply airflow rate. Should the supply airflow rate be sufficient to raise the room pressure above 0.25-inch water gauge, air must be relieved from the room to match ambient conditions through a relief opening connected to a relief shaft. A motor operated damper and a fire damper must be installed in the relief opening.
- Site conditions. If site conditions permit, locate the relief opening, shaft, and gratings as close to the room as possible; they must be sized to prevent an excessive positive pressure build-up in the room.
- Shaft terminus. Depending upon the proximity of the shaft terminus at grade level, mechanical exhaust may be required.

Heating will be provided by means of wall- or ceiling-mounted unit heaters or incorporated into the packaged cooling units.

Similar rooms may be served from a single supply air fan, with individual ductwork connections to each room.

Operation and Control. A room thermostat (set point 78°F cooling/70°F heating) must maintain the room temperature at the thermostatic setting. The outside air supply fan must operate continuously.

An indication of fan operation must be transmitted to the CCF. A dirty filter indicator must transmit a system fault indication to the CCF.

16.2.6 HVAC Equipment

All air-distribution duct systems design must conform to the guidelines in the latest edition of the ASHRAE Handbook – Fundamentals.

Supply and exhaust fans and associated equipment serving multiple rooms must be housed in a dedicated mechanical equipment room. Supply and exhaust fans and associated equipment serving single rooms may be installed within the room that they serve. Exhaust fans must be located as close to the outside air louvers or gratings as practical.

Fans

Supply and exhaust air fans for HVAC duty must be the centrifugal type and may be either direct-drive or belt-drive to suit the required duty. Vane axial fans, either direct-drive or belt-drive to suit the required duty, may be used for fan systems with airflow capacities of 2,000 cfm and above.

Fans must have a minimum total pressure efficiency of 65 percent. The pressure, at duty point, of fans used with substation and traction substation ventilation systems must be no more than 60 percent of the cut-off pressure for stable fan operation.

Fans associated with smoke purge systems must be direct-drive, vane axial type, able to operate while handling hot gasses at a temperature of 482°F (250°C) for a minimum of one hour.

Ductwork and Fittings

Galvanized sheet-metal ductwork must conform to ASTM A653, with zinc-coating thickness rating G90, and be mill-phosphatized and mill-stamped. Stainless-steel sheet-metal ductwork must be corrosion resistant ANSI/AISI Type 316.

The ductwork fabrication must conform to SMACNA construction standards for the pressure classification specified for each system.

Discharge-side ductwork for air-handling units must be constructed for pressure class (inches) equal to the external static pressure of the unit. Suction-side ductwork for air-handling units must be constructed for pressure class (inches) equal to the design suction static pressure of the unit.

Ductwork for supply and exhaust and return fan systems must be constructed for pressure class (inches) equal to the design external static pressure of the supply fan and equal to the design suction static pressure of the exhaust and return fan. Ductwork associated with reversible fans must be braced and reinforced to withstand positive and negative pressure.

Ductwork used for smoke removal must be two-hour fire-rated, galvanized steel and constructed in conformance with SMACNA standards for the system static pressures (as scheduled) and for seal class A/leakage class 6 (downstream of the fan).

All ductwork must have a minimum pressure class of 2 inches.

Elbows must have a minimum full centerline radius at least 1.5 times the width of the duct.

Where full radius curves are not feasible, elbows must be provided with turning vanes. Turning vanes must be the double-radius type.

Access Doors

Ducts and plenums must have access doors to service fans, dampers, turning vanes, etc. Access doors to plenums must be hinged and furnished with latches operable from both inside and outside; door edges must rest against silicone gaskets to form an airtight enclosure. Duct access doors must rest against silicone gaskets and be hinged or fastened by toggle tabs or wing nuts. Access doors in insulated ducts and plenums must be insulated using sheet-metal insulation construction.

Flexible Duct Connectors

Flexible duct connectors must be used on all fan connections to ductwork. The length of each joint must adequately accommodate both horizontal and vertical deflections of the fan units. The length of flexible material must not be less than 4 inches.

Flexible duct connectors for tunnel ventilation and station emergency exhaust fans must be capable of withstanding an air temperature of 482°F (250°C) for one hour.

Dampers

Volume Dampers. All branch ducts must have adjustable, opposed-blade volume dampers. Volume dampers must be equipped with locking quadrants with blades sufficiently stiffened at the edges to effectively close off the duct. Under all conditions of operation, volume dampers must be free from vibration.

Splitter Dampers. Splitter dampers must be used in multiple duct fittings for initial balancing in place of individual opposed-blade volume dampers in each branch of the multiple duct fitting. Splitters must be adjustable through locking quadrants and be single bladed; the blades must have edges sufficiently stiffened to avoid vibration under all conditions of operation.

Backdraft and Relief Dampers. Exhaust fans must have backdraft or motorized shutoff dampers where more than a single-fan discharges into a common exhaust. Weighted relief dampers must be used in exhaust ducts and openings where a positive pressure is required to be maintained by a forced air supply and relief exhaust. All backdraft and relief dampers must be the multi-bladed gravity-type with neoprene cushioning on blade edges.

Air Extractors. Air extractors must be used in branch duct connections and for registers and diffusers where the space to install multi-bladed volume dampers is inadequate. All air extractors must be the movable-blade, pivoted-type.

Fire Dampers, Smoke Dampers, and Combination Fire/Smoke Dampers. Fire/smoke dampers must conform to NFPA 90A. Fire/smoke dampers must be UL 555- or UL 555S-listed, or both, and installed for fire- and smoke-rated separation. Dampers must be made of galvanized steel and capable of returning to a predetermined position (open or closed) upon power or actuator failure. The damper must be fire-rated at two hours, and all related components exposed to the ventilation airflow must operate in an ambient atmosphere of 482°F (250°C) for a period of one hour.

Insulation

Insulation must be provided for:

- All supply ductwork for systems providing tempered or conditioned air—from outdoor air intake to room air supply inlets, including all casings, apparatus, sheet-metal plenum chambers, bypasses, and mixing boxes, including necks of supply air outlets
- All return ductwork for systems providing tempered or conditioned air

In each case, fiberglass insulation must be used. The insulation on indoor ductwork must be composite insulation with a metal jacket or a Kraft facing. The adhesive used to adhere a jacket or facing to the insulation must meet fire and smoke hazard ratings when tested in conformance with ASTM E84, NFPA 255, and UL 723. In addition to meeting these ratings, the adhesive must not exceed a flame spread of 25, a fuel contribution of 50, and a smoke development of 50. Accessories such as adhesives, mastics, cements, tapes, and cloths for fittings must meet similar component ratings.

Supply and return air ductwork within air-conditioned spaces and acoustically lined ductwork do not need to be insulated.

Acoustical liners may be used instead of attenuators for supply and return and exhaust ductwork for the first and last 25 feet of the duct.

Filters

Prefilters will be the synthetic media, disposable flat panel type and will be MERV 1, with a minimum efficiency value of 20 percent (E3) when tested in conformance with ASHRAE Standard 52.2.

Final filters must be the synthetic media, disposable deep-pleated type and must be MERV 9, with a minimum efficiency value of 85 percent (E3) and 50 percent (E2) when tested in conformance with ASHRAE Standard 52.2. Filters must have a maximum face velocity of 500 fpm or less, and a maximum combined (dirty) pressure drop of a 1.5-inch water gauge. Sensors will be provided to measure the pressure across the filter and determine whether dirt has affected the performance of the filter. Unless stated otherwise, the term filter in this section will include the requirement for prefilter and final filter combinations, complete with differential pressure switch
for local and remote indication of high (dirty filter) pressure drop. All filter media will be UL Class 1.

Registers and Grilles

Supply air terminals for use in non-public areas must be double-deflection registers. Base their selection on the required throw and noise requirements for each space.

All registers must be provided with adjustable and double-deflection louvers and spin taps or opposed-blade adjustment volume dampers. All ceiling diffusers will be the square, rectangular, circular, or linear type. They must have adjustable throw, opposed-blade adjustable-volume dampers and adjustable air extractors. Close coordination with the architectural and lighting designs will be required.

Exhaust or return air terminals in non-public areas must be fixed-blade registers. Base their selection on the required pressure drop and noise requirements for each space.

All exhaust and return air grilles must be equipped with fixed, non-see-through blades or louvers, or the duct behind them must be painted matte black. All grilles must be equipped with opposed-blade, adjustable-volume dampers key-operated through the face.

Refrigeration Equipment

Base the selection of system refrigerant and chiller type on lifecycle cost analyses.

Packaged refrigeration equipment must employ refrigerant R22; however, for systems that employ long pipe runs to remote condensers, careful consideration must be given to the maximum concentration of refrigerant that can build up in a space because of refrigerant leakage. If the buildup is found to be in excess of OSHA guidelines, alternative (commercially available) refrigerants must be used. R134a may be used as a replacement for systems designed to operate with R22.

Equipment Foundations

All floor-mounted equipment must be placed on reinforced-concrete housekeeping pads that are at least 4 inches in height. Pits must meet the equipment requirements. All fluid tanks must be double-wall, above-ground insulated, as required for the stored fluids.

Vibration Isolation

All vibration-producing equipment must be isolated from the structure by spring or rubber-in-shear vibration isolators. All piping and ducts attached to rotating and oscillating equipment must be isolated from such equipment by flexible connections.

Seismic Restraint

The following systems must be designed in conformance with the seismic provisions of the CBC:

- Systems used for smoke purge and smoke control
- Systems used for ventilation of tunnel ventilation fan substations
- Systems required for the operation of fire protection/fire detection systems
- Systems related to fire-life safety, including pumps, equipment, controls, major conduit, and piping
- Systems designed using an importance factor of 1.5

Non-essential mechanical systems in conformance with the seismic provisions of the CBC may be designed using an importance factor of 1.0.

Equipment Access and Handling

Requirements for equipment handling and installation must conform to subsection Equipment Access and Handling.

16.2.7 HVAC Design Requirements

Velocities for Air-distribution Systems

Design velocities must provide the required system performance and minimize pressure loss and energy consumption, airborne noise generation, drafts, and the intake of dust particles. Design velocities must not exceed the maximum values specified in section 16.2.2.

Pressure Losses

The static pressure differential across supply or return air terminals must not exceed a 0.25-inch water gauge when the system is operating at full capacity. The static pressure drop across the grille or register must not exceed a 0.6-inch water gauge when the system is operating at full capacity.

Pressure loss must be calculated in conformance with the ASHRAE Handbook - Fundamentals. Duct sizes must have an equal pressure drop.

Energy Conservation

The HVAC system design must conform the requirements established by the California Energy Code and ASHRAE Standard 90.1 for energy conservation.

Air-side economizer cycles must be incorporated into the air-handling system where required by the California Energy Code.

16.3 Plumbing

16.3.1 Functional Requirements

Plumbing systems must convey potable water from municipal water main consumption and service points to DTX facilities including the Fourth and Townsend Street Station and ventilation and egress structures. The plumbing system must collect and convey sewage from service areas to the public sewer system.

Plumbing systems must conform to the CBC and the San Francisco Plumbing Code.

Potable Cold Water Systems

The domestic water services must be sized to accommodate peak demand (plumbing fixtures, service, and makeup) and an additional 10 percent for future requirements. Each domestic water service must have a main shutoff valve, a meter, and a backflow preventer. Remote meter reading facilities must be provided. Base the minimum service requirements for plumbing fixtures on fixture unit values. The service requirements of outlets such as makeup water and hose bibbs must be estimated separately and added to plumbing fixture requirements as a fixed value in gallons per minute to determine the required total service connection capacity.

Water service, meters, and backflow prevention devices must conform to San Francisco Public Utilities Commission regulations. Fire services and domestic water services must connect separately to the municipal mains.

Pressure-reducing valves must be provided at low sections of the system to limit the water supply pressure to fixtures to 60 psi.

Base the sizing of the domestic water distribution lines on maintaining uniform pressure at all plumbing fixtures located on the same level, minimizing shock and water hammer, and maintaining a minimum pressure of 30 psi at each flush valve. All pipelines must be run in a systematic manner; pipelines may run either parallel or at right angles with walls and must be properly pitched for drainage. Long pipe runs, flush valve branches, and quick-closing valves must have water hammer arresters.

Isolation valves must be provided in branch lines and for each floor level to facilitate maintenance. Pressure-reducing valves and backflow preventers must be provided where automatic makeup for HVAC equipment is connected to the potable water system. Cold water piping must be insulated to prevent condensation.

Potable Hot Water Systems

Potable hot water systems consist of water heaters, hot water distribution piping, and pipe accessories. Hot water circulating piping and circulating pumps must be provided where the developed length of hot water piping from the water heaters exceeds 50 feet. Electric temperature maintenance may be used instead of return circulation. All hot water pipes must be sized for the simultaneous fixture demand; pipes serving more than a single fixture must have a minimum pipe diameter of 0.75 inch. All pipes must be arranged in a

systematic manner, and provisions made for thermal expansion and drainage. All hot water piping must be insulated. Isolation valves must be provided for all branches to facilitate maintenance.

In general, use of local point-of-use electric water heaters is encouraged for remotely located fixtures having small demand. Electric point-of-use domestic water heaters must be of the storage or tankless type. They must be glass-lined with fast-acting immersion heating elements. Heaters must be equipped complete with temperature and safety controls and thermal insulation. Water heaters must be properly sized for the demand on the plumbing fixtures they serve; water heaters must be UL-listed and bear the ASME stamp.

Soil and Waste Systems

Soil and waste systems consist of soil and waste piping from all plumbing fixtures and floor drains (except for drains carrying clear water waste), sewage ejector stations, and ejector discharge piping. Sewage ejectors, where required, must be the submersible non-clog type. Submersible grinder pumps must be used in caverns where high discharge heads are required. Where practical, soil and waste lines must function by gravity flow. Sewage ejector stations must be installed where gravity outfalls cannot be provided. Base the size of all soil and waste pipes on fixture unit values. For continuous or intermittent flow into drains, such as flows from a pump, a fixture unit value of 2 must be assigned for each gallon per minute of flow at rated capacity. Connection to the City sewers must conform to the City plumbing code.
Piping installed underground or embedded in structure must not be less than 2 inches in diameter.

Sewage ejector systems must consist of a wet well with non-clog, submersible, wet-well centrifugal pumps. Water level controls, electric pump on-off automatic switches, pump trouble, and high-water alarms must annunciate to the CCF. Pumps must be sized for 100 percent of the sanitary flow rate. The pump head must suit static and friction head of installation, and the pump motors must be non-overloading throughout the entire pump curve without employing the service factor.

Vent Systems

All soil and waste systems must have complete vent systems, sized in conformance with the CBC. All horizontal vent pipes must be kept as short as possible and pitched at 0.25 inch per foot toward the soil and waste pipes served. Vertical risers to the outside must be accomplished in the most direct way.

Compressed Air System

A compressed air system for the emergency ventilation system must be provided, including a 150-psi duplex air-compressor plant piped to all pneumatic dampers. Duplex rotary screw air-compressors, receiver, prefilters and final filters, and desiccant dryers must be installed in the mechanical room. Piping must be run to all air actuators and be properly sized to handle air loads expected at each damper. Piping must conform to applicable plumbing codes and ordinances. Drains must be provided at all low points in the piping system.

16.3.2 Piping Systems

All piping systems fittings, flanges, valves, and accessories must conform to all applicable sections of the CBC.

Piping

The appearance of all piping systems must be neat. All pipes must be properly sloped for drainage and venting, supported, guided, and anchored to provide complete flexibility. Piping systems must maintain the integrity of all systems without any damage or leaks during extremes of operating conditions. Piping must be accessible. Piping must not be embedded in concrete structures unless embedment is unavoidable because of architectural or structural requirements. Embedded piping must be provided with adequate clean-outs or access points. All valves and accessories must be accessible for operation without the use of chains or additional operating platforms. Sleeves must be provided wherever pipes pass through structures, and escutcheons must be provided in finished areas.

Pipe and Fittings

Exposed (non-embedded) sanitary, vent, and storm piping measuring 6 inches in diameter and smaller must be no-hub or hub-and-spigot cast iron. Exposed sanitary, vent, and storm piping larger than 6 inches must be service weight cast iron with bell-and-spigot joints and caulked or compression type gaskets. As an alternate, exposed storm piping 6 inches and larger may be Schedule 40 galvanized steel pipe with threaded or grooved couplings. Sanitary, vent, and storm piping installed in ground or embedded in structure must be of extra heavy cast iron with bell-and-spigot joints with compression gaskets.

Use ductile iron piping for pipes larger than 15 inches.

Cold water piping installed in ground or embedded in structure must be annealed copper tubing Type K. All other hot- and cold-water piping must be hard drawn copper tubing Type L with wrought brass or copper fittings. Copper tubing must conform to ASTM B 88.

Water service piping must be cement-lined ductile iron with mechanical joint fittings with retainer glands.

Force mains installed in ground or embedded in structure must be cement-lined ductile iron pipe with mechanical joint fittings with retainer glands.

Dielectric couplings must be provided to connect pipes of dissimilar metals.

Piping Accessories

Piping accessories must include strainers, vent cocks, dirt and drip legs with drain and flush connections, liquid flow indicators, vacuum breakers, backflow preventers, pressure-reducing valves, shock absorbers, water-hammer arresters, balancing cocks, relief valves, isolation valves, and pressure and temperature gauges. All piping accessories must be sufficiently sized to ensure trouble-free balancing, control, access, and the operation of all piping systems.

Piping accessories requiring maintenance or replacement must be placed in accessible locations. The dials of gauges and indicators must show English units of measure or measurements in both English units and International System of Units. Gauges and indicators must be sufficiently sized and arranged to be easily seen and read.

Piping expansion joints must provide for not less than 150 percent of the calculated transverse movements. All valves must be tagged and charted.

Unions or flanges must be provided on both the inlet and outlet sides of all apparatus, isolation valves, control valves, and accessories to facilitate easy removal for servicing.

Wherever two pipes made of dissimilar metals are connected, a dielectric union must isolate one pipe from the other.

Valves

Isolation valves must be provided on both sides of chillers, pumps, heating coils, cooling coils, control valves, multiple installations, and piping branches. Valve installations must be neat and provide easy groupings, with all parts accessible for operation and maintenance. Valve stems must be horizontal wherever possible.

Pipe Supports, Hangers, Guides and Anchors

The design of pipe supports, hangers, guides, and anchors must ensure proper alignment of all pipes for operating conditions. Consider the forces caused by the weight and motion of the fluid, water hammer forces, the weights of piping, valves and insulation, and thermal expansion and contraction in the design, as appropriate.

All hangers and supports must be arranged to prevent the transmission of vibrations from the piping to the structure. Anchors and guides must allow pipes to expand and contract without a build-up of excessive stress. Spring hangers must be used when piping is connected to vibrating equipment and where supporting vertical pipes.

Pumps

Pump type must be centrifugal, single, or double suction base-mounted, or inline. Pumps must be arranged so that they can be serviced without removing the piping system, including disconnecting piping from the pumps. Pumps must conform to the following:

- Maximum pump speed: 1,800 revolutions per minute
- Operating efficiency at design flow rate: Within 5% of maximum efficiency
- Motor sizing criteria: Non-overloading throughout full range of pump curve, without using the 15% motor service factor

Constant flow water pumps must be used when the pump motor is less than 18.6 kilowatts.

Insulation and Freeze Protection

All water piping, including cold water piping, hot water piping, water piping subject to freezing temperatures, and horizontal storm lines and portions of drainage lines subject to sweating must be insulated. Water piping subject to freezing temperatures must be electrically heat traced.

Exposed water pipe in tunnel and emergency exit areas must be protected with a metal jacket.

Cellular glass with jacket insulation must be used. Insulation and accessories must conform to the fire and smoke hazard ratings of the following testing procedures: ASTM E 84, NFPA 255 and UL 723. In addition,

insulation and accessories must not exceed a flame spread of 25, a fuel contribution of 50, and a smoke development of 50.

Water Treatment

Chemicals, service, and equipment must be provided for chilled water, condensing water, and hot water systems.

Corrosion Control

See CHAPTER 20, Stray Current and Corrosion Control, for requirements for the protection of buried pipe and fittings from corrosion.

16.3.3 Plumbing Fixtures

The location and type of plumbing fixtures must be fully coordinated with the architectural requirements. Fixtures intended for use by the disabled must conform to the CBC, City plumbing code, and Americans with Disabilities Act accessibility guidelines. Plumbing fixtures must be of the water saver type. Fixtures in toilet rooms must have electronic flushing and water supply devices.

Battery rooms and any other areas where corrosive materials are handled or stored must have emergency eye wash and body spray facilities. Hose bibbs must be provided at platform levels to facilitate cleaning operations.

Fixtures

Fixtures must conform to the following requirements:

- Water closets
  will be wall-hung, of the siphon-jet, elongated-bowl type, and provided with an automatic flush valve.
- Urinals
  will be wall hung, of the siphon-jet type, and provided with a flush valve.
- Lavatories
  will be wall hung.
- All wall-hung fixtures
  will be supported by standard chair supports.
- Service sinks
  will be of stainless-steel or monolithic precast terrazzo equipped with a stainless-steel rim guard. Service sinks in battery rooms will be acid-resistant and supplied with a wall hanger, rim guard, and trap standard.
- All supplies to fixtures
  will have key-operated service valves.

Service piping connections for plumbing fixtures must conform to the specifications in Table 16-3.

Table 16-3: Plumbing Fixture Schedule

Fixture	Symbol	Soil or Waste	Trap	Vent	Hot Water	Cold Water
Water Closet	WC	4 in.	Integral	2 in.	No	1.25 in.
Urinal	UR	2 in.	Integral	1.5 in.	No	1 in.
Lavatory	LAV	1.5 in.	1.25 in. x 1.25 in.	1.5 in.	0.5 in.	0.5 in.
Service Sink	SS	3 in.	3 in.	1.5 in.	0.75 in.	0.75 in.
Mop Sink	MS	3 in.	3 in.	1.5 in.	0.75 in.	0.75 in.
Eye Wash Station	EW	1.5 in.	1.25 in. x 1.25 in.	1.5 in.	0.5 in. tepid	

16.4 Drainage Systems

The DTX tunnel, Fourth and Townsend Street Station, and ventilation and egress structures must have a drainage system to collect, convey, and remove groundwater seepage, stormwater runoff, and discharge from fire protection systems. Miscellaneous mechanical and staff rooms in the Fourth and Townsend Street Station and ventilation structures must have floor and area drains. The drainage system must convey drainage
to the City sewer system.

16.4.1 Tunnel Drainage Systems

A below-track drainage system must be provided in the tunnel and U-Wall to convey water to City sewers and prevent flooding of the tunnel. Interceptor drains must be installed between the southern limit of the U-wall and tunnel portal to collect and convey rainwater to a sump at Fourth and Townsend Street Station. The system's design must also prevent water from topping the track plinth when the under-platform deluge or other fire suppression system has been activated. The drainage system design must conform to the City plumbing code.

The track drainage system must consist of inlet drains, interconnecting piping, sump pits, sump pumps, and discharge piping to the street sewer connections.

In the Fourth and Townsend Street Station, the drainage system must accommodate inflow from two fire hose streams from the platform standpipe system, drainage (seepage through structure walls, etc.), and one under-car water spray protection system zone.

The drainage system must be capable of preventing tunnel fire standpipe system discharge (during tunnel fire events or standpipe testing). The drainage system must be designed to collect, convey, and remove infiltrated water resulting from the seepage of water into the tunnel (see Table 12-5 and Table 13-1).

Track drainage must follow the requirements of NFPA 502 section 12.10 and the following additional requirements:

- Tunnel track drainage system must effectively collect and remove water from the tunnel resulting from condensation, groundwater leakage, rain entering the tunnel, spilled water, fire-fighting activities, cleaning, and other sources.

- Runoff from outside the tunnels must be prevented from entering the tunnel.
- Drainage for tunnel track section must be accommodated in a trough with cover or pipe in the center of the trackway tunnel slab based on a gravity drainage system.
- Critical facilities, such as traction electrification system, automatic train control, communications, portal sites and facilities, vent structures, traction power supply sites, operations control centers, etc., must be designed so that the finish floor elevation or top of slab foundation of these facilities are a minimum of 2 feet above the 100-year floodplain.

Inlets and Piping

Drain inlets must connect to main drain lines below the track slab. According to the California High-Speed Rail Authority Design Criteria Manual, the minimum diameter of the track drainage system must be 12 inches. The slope of the main drain lines must match the slope of the track profile and be sized to produce a minimum velocity of 2.5 fps with the pipe flowing half full. Minimum slopes must comply with the specifications showing in Table 16-4.

Table 16-4. Minimum Slope Specifications

Pipe Size	Minimum Slope
4 inches	2.0% or 0.25 in. per foot
6 inches	1.0% or 0.125 in. per foot
8 inches	0.65%

If used for main track drains, fiberglass piping must not be exposed in its installed position. Suitable adapter fittings must be provided for connections between different pipe materials.

Sump Pits

Sump pits must be located at appropriate points along the trackway.

Sump pits must be provided with oil and grease separators and sand traps for extraction of oil, grease, sand, and other substances that are harmful or hazardous to the structure or public drainage systems. All separators and traps must have sufficient capacity to retain all sludge between cleanings.

Pump Stations

Drainage pump stations must be provided at the Fourth and Townsend Street Station, tunnel low points, and elsewhere, as deemed necessary by design. The pump stations consist of a wet well with three submersible pumps, water-level controls, electric pump on-off automatic switches, alternator, pump trouble, and high-water alarm annunciation to the CCF, and connections to City sewers. Each pump must have a pumping capacity of one-half of the station drainage volume. The third pump must be considered a standby. Pump head will suit static and friction head of installation. Pumps must be connected to the emergency power source.

Each pump must have a guide rail system, complete with discharge base elbows, sealing flange, guide rails, brackets, and lifting chain/cable.

16.4.2 Floor and Area Drains

All floor and area drains must be the bottom-outlet type, where possible. Where space is not adequate to use bottom-outlet drains, drains with side outlets may be substituted. Floor drains in public areas must be finished in nickel-bronze or stainless-steel; the finish will be determined by floor material and coordinated with architectural requirements. Floor drain gratings in public spaces must be fastened with vandal-proof screws.

Provide floor drains in mechanical rooms, toilet rooms containing two or more water closets (or a combination of one water closet and one urinal), under-platform areas, and battery rooms at the emergency eye-wash/shower unit.

Provide area or scupper drains at station entrance areas and in vent shafts.

Depressions in slabs, as required for escalator and elevator pits, must also contain drains. Where possible, drains must be connected by gravity to the track drainage system. Where gravity drainage is not possible, provide sump pits with sump pumps or dry sumps (depressed slab for portable sump pump).

Traps

Traps must be of plain pattern and have a seal of not less than 2.5 inches and not greater than 4 inches. Traps must be of the same material as the piping to which they are connected. All exposed traps in toilet rooms must have a chromium finish. Provide deep-seal traps where floor drains are not used frequently.

Cleanouts

Provide cleanouts on all soil, waste, and drain lines as follows: at 50-foot intervals, at changes of direction greater than 45 degrees, and at the base of each stack and leader.

All cleanouts brought to finished floors must terminate with removable covers flush with the floor. Cover material and finish must complement the floor finish.

Cleanouts for pipes 4 inches and smaller must be the same size as the pipe served. Cleanouts for pipes larger than 4 inches must be not less than 4 inches or one-half of the size of the pipe served.

Avoid, where possible, floor cleanouts in public areas.

CHAPTER 17 ELECTRICAL SYSTEMS

SCOPE

This chapter establishes the requirements for electrical systems for the Downtown Rail Extension (DTX) facilities, including the tunnel, Fourth and Townsend Street Station, Transit Center train box fit-out, ventilation and emergency egress structures, and related ancillary facilities.

Electrical systems comprise power distribution, unit substations, and secondary (low voltage) distribution equipment for tunnel and facility lighting and power; power for tunnel ventilation, HVAC, drainage, communications systems, safety and security systems, and associated raceways, conduits and wiring; and interfaces of the DTX electrical system with other rail systems.

The electrical design requirements must be coordinated with other chapters of this manual as follows:

- Chapter 3: System Safety and Security
- Chapter 15: Fire-Life Safety
- Chapter 16: Mechanical Systems
- Chapter 18: Rail Systems
- Chapter 19: Communications

CODES, STANDARDS AND GUIDELINES

Electrical systems design for the DTX must conform to the latest versions of the following codes, standards and guidelines unless otherwise specified in these criteria:

- American National Standards Institute (ANSI)
- American Society of Industrial Security
- ASTM International standard – ASTM B3, Standard Specification for Soft or Annealed Copper Wire
- California Building Code (CBC)
- California Code of Regulations (CCR)
- California Electrical Code (CEC)
- Code of Federal Regulations (CFR), Title 47, Telecommunication
- Electronic Industries Association (EIA)
- Federal Communications Commission (FCC)
- Illuminating Engineering Society (IES)
- Institute of Electrical and Electronic Engineers (IEEE)
    - IEEE 446, Standard for Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications
    - IEEE 1202, Standard for Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies

  - IEEE 1584, Guide for Performing Arc-Flash Hazard Calculations
- International Electrical Testing Association
- National Association of Corrosion Engineers (NACE), Code NACE RP0177, Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems
- National Electrical Manufactures Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association – NFPA 70, National Electrical Code (NEC)
- National Fire Protection Association (NFPA) 130, Standard for Fixed Guideway Transit and Passenger Rail Systems
- Occupational Safety and Health Administration (OSHA)
- Underwriters Laboratories (UL)
- United States Environmental Protection Agency (USEPA)

17.1 General Requirements

The more restrictive requirements of these codes governs the design. Where no provisions are included in these governing codes for specific design features or requirements, follow best industry practice.

The design may require integration of the DTX electrical systems into existing Caltrain systems in cases where common operation is required, such as the interface of the Fourth and Townsend Street Station and the existing Caltrain station at 4th and King streets and within the Transit Center.

All work must generally, as applicable, and where not in conflict with the requirements in this design criteria, conform to the Caltrain Engineering Standards where DTX systems are derived from or interface with Caltrain systems.

17.1.1 Power Supply

For reliability, the power supply to DTX facilities must be from two independent feeders from the electric utility. In addition to the dual power feeds, a standby emergency generator must be provided.

17.1.2 Utilization Voltage

The voltage rating of power equipment and motors must be as follows:

- Closed-circuit television (CCTV) cameras: 120 V, single phase
- Communications equipment: 120 V, single phase
- Convenience outlets: 120 V, single phase
- Exit signs: 277 V, single phase
- Vending machines: 120 V, single phase
- Heaters to 2900 watts: 120 V, single phase
- Heaters 2901 to 5500 watts: 208 V, single phase

- Heaters 5.5 kilowatts and up: 480 V, three phase
- Lighting fixture, LED and fluorescent types: 277 V, single phase
- Lighting fixture, incandescent fixtures or compact fixtures: 120 V or lower, single phase
- Motor controls: 120 V, single phase
- Motors smaller than 373 watts: 120 V, single phase
- Motors 373 watts and up to 74.6 kilowatts: 480 V, three phase
- Motors, larger than 74.6 kilowatts: 4160 V, three phase
- Station signage: 277 V, single phase
- Special power outlets: as required

Alternate voltage levels may be used where practical and safe for the equipment.

17.1.3 Medium Voltage Feeders

For loads 50 kVA and higher with feeder lengths of 1,500 feet or longer, an evaluation must be performed to determine the more cost-effective system voltage between 4,160 V and 480 V.

17.1.4 Motor Control

Combination starters or manual starters must be provided for motors larger than 373 watts. Full voltage across-the-line starters must be used.

Manual motor starters must be NEMA size M-1 and may be used where local control is manual.

Grouped motor control centers must be used where two or more motors are in proximity, and starters are not furnished with the equipment.

Reduced voltage starters or “soft starters” must be used for motors 37,300 watts or greater on 480 V three-phase systems

17.1.5 Enclosures

Equipment enclosures must be of a NEMA classification suitable for the environment to which the equipment is exposed. NEMA 1 galvanized enclosures are for interior use only in dry, ventilated room temperature locations only. Where NEMA 4 watertight enclosures are required, bolt-down covers must not prevent access to the equipment. NEMA 4X (stainless steel grade 316) enclosures must be used in tunnel locations and areas exposed to rain or water and wind-borne particulate dust/carbon debris.

17.1.6 Wiring Methods

Wiring must be in conduits or ducts. Cable trays may be used only in areas approved by the TJPA.

17.1.7 Wire and Cable Pulling

Pulling calculations must take into account wire and conduit type, the number of 90-degree bends, and the change in elevation between pull points. The maximum number of bends allowed in any one conduit run must be as specified in the NEC.

17.1.8 Cables

Insulated cables must be appropriate for the voltage level, and readily available sizes must be used throughout the DTX. The number and size of cables in a particular circuit must be determined to provide adequate capacity, acceptable voltage drop, and system fault level.

17.1.9 Seismic Design

The design of equipment, equipment anchors, components, piping, raceways, and devices must conform to the criteria in Chapter 10, subsection 10.8, Non-structural Components.

17.1.10 Safety and Security Considerations

Building and equipment grounding must conform to the NEC. Solidly grounded systems, or low-resistance grounded medium voltage systems, must be used at distribution and utilization voltage levels. Additionally, where applicable, grounding provisions must follow the recommendations of NACE Standard RP0177-95, Standard Recommended Practice, Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems.

Heavy-duty disconnect switches (with appropriate NEMA enclosure type) must be provided where required by the NEC as a means to disconnect equipment from its feeder when equipment is not within the sight of either the feeder breaker or motor controller, as safety a switch for transformer primary side de-energization or where advantageous to separate feeder from electric loads to be supplied by others.

Overcurrent protection elements that are (a) designed to protect conductors serving emergency equipment motors (e.g., fans, dampers, pumps), emergency lighting, and communications equipment and (b) located in spaces other than the main distribution system equipment rooms must not depend on thermal properties for operation.

Electrical equipment and wiring materials and installations within stations and ventilation structures must conform to the requirements of NFPA 130, sections 5.4 and 7.7, respectively.

Equipment, raceways, and conductors in smoke exhaust plenums must be either rated or de-rated for operation at the expected elevated temperatures.

Conductors and cables interconnecting equipment, cabinets, or both, must be enclosed in conduits or raceways.

Battery rooms and rooms where batteries are charged must be ventilated. Lead-acid battery chargers must be interlocked with the mechanical ventilation to prevent charging without ventilation. The electrical system for the battery room and mechanical ventilation systems must conform to NFPA 70. Battery rooms must have hydrogen detection systems for worker safety and gas leak event notification.

The lighting systems design must provide the intended quality, visual comfort, and quantity of light for the individual areas. Lighting must be arranged so that any single unit failure does not leave an area in total darkness. Battery fixtures (where used) must have a minimum 90 run time capacity in conformance to NFPA 101 section (101) 7.9.2.1. Lighting fixtures must be accessible for inspection and maintenance.

17.2 DTX Power Supply and Distribution System

Each DTX facility must be served by two sources of power designated as primary priority and secondary priority feeds. One utility service must serve as the primary priority feed. The secondary priority feed must be a second independent utility service. A standby generator must also be provided for emergency use if both utility feeds are out of service. The design and function of the DTX traction power supply and distribution system must conform to Chapter 18, Rail Systems.

Alternative arrangements satisfying these criteria may be submitted for the TJPA's review and acceptance.

17.2.1 Electrical Service

Normal Power

Incoming electrical metering, service disconnects, and transformation and distribution equipment switches must be of sufficient capacity to accommodate normal power loads and power provisions for tenancy spaces. The normal power (non-essential) loads include the following:

- Lighting on platforms, cross passages, stairs, support spaces, and mechanical and electrical rooms
- Escalators and elevators
- HVAC systems: ventilation systems (fans) that are not used for life-safety purposes and air conditioning equipment (chillers and related pumps)
- Miscellaneous loads: convenience receptacles, hot water heaters, ticket vending machines, visual information systems
- Tenant space provisions

17.2.2 Emergency Power

Equipment and systems serving life-safety and other critical operations must be considered essential loads. Emergency power sources must be provided to power all essential loads, which include the following:

- All egress and exit lighting, including exit stairwells, escalator comb and newel lighting, and emergency lighting for support spaces and mechanical and electrical rooms
- Vertical circulation systems: elevator machine rooms and elevators, including elevator cab lighting where used for firefighting, and selected escalators
- HVAC systems: ventilation systems (fans) which are used for life safety purposes (e.g., smoke exhaust and stair pressurization fans)
- Other loads: sprinkler system compressors, fire alarm system, public address system, security systems, CCTV system, blue light stations, heat tracing, elevator pit sump pumps, effluent pumps, and elevator cab lighting

- Fire pumps
- Tunnel ventilation fans and dampers, stair pressurization fans, track isolation dampers, and mechanical controls
- Alternating current and direct current switchgear controls

Emergency power system design must also conform to the following requirements:

- Lighting must be fully functional within less than 10 seconds of a normal power outage event.
- Unit substations, transformers, and switchgear rooms must have a minimum of 50 percent of the lighting available from the emergency system.
- During power failures, emergency power must be available for a minimum of 90 minutes at each station for safety-critical functions, in conformance to NFPA 101.
- Emergency power system design must conform to IEEE 446, Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications, and NFPA 130.
- Wires and cables for emergency power and circuits must be run in separate raceways, independent of other electrical loads.
- An emergency bus must be provided to supply power to emergency loads in the event of power failure from the utility. The design of the emergency power supply system must consider the proximity of facilities within a common site, such that only one diesel-generator set is used to supply the emergency loads in all the facilities within a site.
- Emergency life-safety electrical loads must be located in designated life-safety power panels. Only life-safety loads (egress lighting, exit signs) may be located in life-safety or emergency-use power panels.
- Space must be provided for wayside cabinets to onboard communication systems and repeaters (if required).

Emergency Generators

Emergency generators must conform to the following requirements:

- Emergency generators to provide power to emergency systems must be installed, tested, and maintained in conformance to NFPA 110.
- Generator fuel supply must allow 8-hour operation and monthly exercising for 30 minutes. Anticipated maintenance and fuel refill at 6-month intervals must be assumed.
- Provisions must be made to permit draining the fuel tank at the bottom of the tank. The generator fuel tank must be an integral part of the generator assembly and must be located to provide access for refueling trucks. Generator fuel tank must be of double-wall construction and include leak detection notification on an annunciator-type panel.
- Generators must be located at street level where possible. Generator room access doors must face the street, be large enough to allow the removal of the generator from the room and be lockable. The generator control panel must be accessible from the floor level, and control devices must be within reach without the need to use steps or ladders. Generator sets (genset), radiators, and motors must be manufactured in the United States and be from the same manufacturer. The minimum warranty must be one year after construction is completed.

- Walk-in (enclosure) type generators must be rated to a wind load of 120 mph. The roof load must be equal to 40 psf. Distributed floor load must be 200 psf. An enclosure rain test must be equal to 4 in/h. Seismic design must assume walk-in generators are essential facilities.
- The roof must incorporate a positive camber and comprise mill-finish, extruded 6036-T6 aluminum perimeter channel or roof rail with 16 gage roll-formed galvanized cross members mechanically fastened
  to the roof rails. The roof must have total of 4 lift rings per side. The roof skin must be a nominal .04-inch-thick 3003-H16 or 3105-H14 mill-finish aluminum sheet and fastened to the roof rails and bows. The top skin must be rolled over the perimeter of the roof to provide additional weather protection. A weatherproof mastic sealant must be used at the perimeter as well as at any joints required.
- Enclosure walls must be manufactured using mill prepainted .04-inch-thick 3004-H36 aluminum panels hard riveted to fabricated alumized steel Z-section wall posts located on 24-inch centers. The enclosure walls must incorporate an extruded structural “panel cap” of mill-finish, extruded 6063-T6 aluminum. The panel cap must interlock into the adjoining roof rail for a weatherproof structural connection between the roof and the sidewalls.
- The floor structure for the enclosure must be rated for a minimum distributed load 200 psf and be reinforced, as required, to support prevailing point loading. The floor and underframe assembly must consist of rectangular steel tubing or structural I-beams welded to form the outer perimeter.
- The perimeter must be combined with formed or structural steel crossmembers to create a welded steel support for the installed power generation equipment. A steel channel must be incorporated into the floor structure for adequate structural support and attachment of the generator set and vibration isolators. The cross members must be overlaid with a composite 0.72-inch-thick oriented strand board covered by 14-gage minimum diamond steel plate for load distribution.
- A fuel tank must be installed beneath the floor and be listed as the primary containment above-ground tank for flammable and combustible liquids, in conformance to UL Standards and mounted within a combined rupture basin/floor/underframe. The interstitial space between the tank and the basin must be monitored (through electronic means) to indicate a rupture condition. Fuel tanks must be available as standard manual fill tanks (day tanks). All fuel tanks must include drainage and supply and return lines and fuel valve control. Fuel tanks must be outfitted with an electronic fuel monitoring system. The system must be programable and digital. Output from the sender must be 4-20 mA and wired directly to the process meter. A local LED display must indicate the fuel level in gallons and indicate when the tank is full (FUEL FILL) and when the fuel level is low (LOW LEVEL). An independent float-operated contact must be supplied to indicate a rupture (leak) condition. Optional monitoring accessories (4-20 mA) must also be made available.
- Commercial doors must be of 18-gage galvanized steel construction painted to match the enclosure exterior and incorporated into 16-gage painted galvanized steel frames that are structurally integrated into the enclosure wall. Door opener handles must be stainless steel.
- Lift rings must be provided at the base of the tank perimeter for the purpose of lifting the complete enclosure with installed genset and empty fuel tank into place. The lift rings must be of 1.25-inch nominal steel plate and welded into the base perimeter at four locations.
- Inlet and exhaust air handling equipment must be designed to maintain a combined total maximum static pressure drop 0.5 inch of water gage through the enclosure, including all air handling devices. Inlet air must be through a fixed or operable louver, weather hood, acoustic grid, or combination thereof, as specified, and provide the necessary level of attenuation. Inlet openings must be screened and sized to minimize entrance of debris and precipitation. Air discharged from the enclosure must be through gravity or motor-operated discharge dampers, weather hoods, acoustic

grids, plenums, or a combination thereof, and provide the necessary level of attenuation. Discharge openings in fixed devices must be protected within the screen.

- Non-walk-in exterior generator enclosures must be equivalent (to the walk-in type described in this subsection) in enclosure-construction materials (roof and walls), fuel tanks, lift points, and air handling equipment.

17.2.3 Power Distribution

Normal and emergency power must be distributed to DTX facilities by means of dedicated independent distribution systems.

Normal and emergency power circuits must be physically separated (in separate power panels) to the maximum extent possible except in equipment rooms or where necessary to connect to common equipment.

Auto transfer switches must conform to NFPA 70, NFPA 110, and appropriate UL standards. The automatic transfer switches and bypass isolation automatic transfer switches must be designed, manufactured, and tested in conformance to the following:

- Transfer switches (must)
  - be designed to switch the load connection between two power sources.
  - include electrical and mechanical interlocks to prevent unintentional paralleling of the power sources.
  - be of double-throw construction and include power switches, circuit breakers, or both, in a fixed-mount configuration, with high-endurance characteristics capable of no-load and full-load interruptions equal to or exceeding UL standards endurance ratings.
  - include a mechanical coupling to facilitate completion of an open in-phase transition, such that any inrush current is equal to or less than normal starting current for inductive loads.
  - must include removable arc chutes, housed within an arc chamber constructed of high-dielectric high-strength material, that are mounted over each set of main contacts. Arc chutes must be constructed of metal plates and a baffle cover designed to extinguish an electrical arc and protect the main contacts. An insulating channel shield must be mounted above each power switch o circuit breaker to redirect flash from the arc chutes away from the enclosure front. A steel, dead-front panel must be mounted at the front of each power switch or circuit breaker to provide a physical barrier when the front door is open.
  - include pushbutton controls, mounted directly on the power switch or circuit breaker, to perform manual operation with an electrical load connected.
  - provide colored mechanical indication of main contact position (open or closed), mounted directly on the power switch or circuit breaker, for source 1 and source 2.
  - provide a colored mechanical indication of the charge state (charged, discharged), mounted directly on the power switch or circuit breaker, for source 1 and source 2.
  - be open transition and provide an in-phase monitor permitting an in-phase transition between two live sources that have a phase angle difference of +/- 8 degrees or less (no generator sources) and +/- 5 degrees or less (1-2 generator sources).
  - be of copper bus construction. A copper ground bus must be furnished firmly secured to the enclosure structure

- Generator docking stations/controls (must)
  - conform to NFPA 70 and NFPA 110. The docking stations must be fully designed to accommodate input feeders of permanent and temporary generators. Life-safety circuit breakers must be in different compartment inside enclosure from standby service circuit breakers.
  - be automatic and switch between generator (1) and generator (2) during a power failure.
- Transfer switch main contacts must be of silver composition, electrically operated, and mechanically held in position. Inspection of the main contacts must be possible from the front of the transfer switch without major disassembly.
- Power switches and circuit breakers must include an electrical operator with a reliable two-step stored energy mechanism to charge the closing springs. The closing springs must be capable of being charged electrically or manually. The closing of the main contacts must automatically charge the opening springs to ensure quick-break operation. After closing the main contacts, the closing springs must be capable of being recharged.
- Control wires must be type SIS, and wire bundles must be secured to the assembly with nylon ties, pre-punched lances, or anchors. All current transformer secondary leads must first be connected to shorting terminal blocks with shorting screws. Control wires must be marked with an origin and destination over the entire length of the wire using a cured ink process to the maximum extent possible. Where ink marking is not possible, printed sleeve wire markers at each end of control wire must be provided.
- Mechanical type lugs must be provided for all source 1, source 2, and load terminations suitable for copper or aluminum cable.
- Front access to all power switch and circuit breaker secondary connection points must be provided for ease of troubleshooting and connection to external field connections.
- Bus primary means of insulation and isolation must be by air gap. Minimal use of insulating material in addition to the air gap must be provided.

Feeders

Feeders must also conform to the following requirements:

- Normal and emergency feeders must be provided from service switchgear to distribution equipment located in electrical rooms. The number and location of these electrical rooms must be determined so that the loads served are located within reasonable distances. Feeder conductors must be copper only.
- Feeder lines must be equipped with load-interrupting switches with current limiting fuses, transformers, secondary circuit breakers, and 480 V switchgear with the required quantity of 480 V distribution panels for their associated connected loads.
- In ventilation structures with ventilation fans rated at 4,160 V, double-ended transformers, 4,160 V switchgear with tie-breaker, and associated 4,160 V controllers must be provided.
- Feeder lines from the electric utility must incorporate utility metering designed in conformance to the electric utility's standards. Secondary side metering at 4,160 V and 480 V, as applicable, must also be provided.
- Specific details of the power distribution system must be shown on a single-line diagram complete with all necessary metering, monitoring, and control requirements. Switchgear, controller, and

switchboard equipment must meet all fault duty and ampacity requirements; circuit breakers must provide selective coordination.

Distribution Panels and Switchboards

Normal and emergency distribution panels and switchboards must be housed in DTX electrical rooms. These panels and switchboards must supply loads at utilization levels directly, or by means of lighting and receptacle panels, also located in DTX electrical rooms. Switchboards, power panels, and lighting panels must have fully rated circuit breakers.

Lighting Panels

Normal and emergency lighting loads must be supplied from separate panels. Circuit breakers for lighting branch circuits must be rated for switching duty service.

Receptacle Panels

Receptacle panels must supply power for receptacles and other 120/208 V miscellaneous loads by means of step-down (dry type) transformers, located with the panels in DTX electrical rooms.

17.3 Voltage Drop Limit

Voltage drops must be generally limited to a maximum of 5 percent total on both feeders and branch circuits. Maximum allowable voltage drop from 480 V or 208 V switchboards must not exceed 3 percent for all branch circuits. See subsection 17.1.2, Utilization Voltage.

17.4 Electrical Equipment Requirements

The design must incorporate space for electrical equipment, including conduit and cabling, with required protection (duct banks, raceways, cable trays) and maintenance access (manholes and pull boxes).

Design and installation of electrical equipment must conform to the NEC and all other applicable codes, rules and regulations and must meet the following requirements.

17.4.1 Equipment Location

Electrical power distribution equipment must be located in dedicated electrical rooms. The electrical rooms must be sized to allow for the equipment and any foreseeable system expansion. Lighting and Power electrical panels must include 20 percent spare circuit breaker capacity.

Receptacles, switches, and lighting must be provided in all rooms.

17.4.2 Equipment Designation

Equipment must be numbered on plans and single-line diagrams. Each piece of electrical equipment must be numbered according to the number of the feeding circuit breaker, except termination cabinets, which must be numbered sequentially.

Equipment numbers must be preceded by letter designations as follows:

Switchboard	A
Power panelboard	P
Lighting panelboard, 480/277 V	L
Auxiliary power panel, 208/120 V	LA
Transformer	X
Control panel	CP
Disconnect switch	Z
Motor	M
Motor starter	MS
Terminal cabinet	TC
Automatic transfer switch	ATS
Fare collection power panel	F
Supervisory termination cabinet	STC
Motor control center	MCC

17.4.3 Motors, Starters, and Controls

In general, motor control centers with combination starters of the motor circuit protector types must be used for 480 V motors. Control centers must be equipped with either a main circuit breaker or a fused circuit breaker with main busses that are adequately braced to withstand the available short-circuit current. Individually mounted combination starters of the motor-circuit protector types may be used where electrically advantageous and where the starter can be located in a physically secure area.

17.4.4 Switchboards/Panelboards

The distribution, lighting, and receptacle panelboards must be the molded-case, circuit-breaker type with copper bus. Circuit breakers must be the bolt-on type. The switchboards and panelboards must be constructed of code gauge galvanized steel. Panelboards must be of door-in-door construction. The lighting and receptacle panelboard cabinets must be provided with hinged doors and locks. Minimum, 20 percent, spare circuit breakers must be provided. Switchboards and panelboards must have fully rated circuit breakers.

17.4.5 Disconnect Switches

Heavy duty disconnect switches must be provided as required by the NEC as a means to electrically disconnect equipment from its feeder when equipment is not within the sight of either the feeder breaker or motor controller, or where there are advantages to separating the feeder from electric loads supplied by

others. In general, disconnect switches must be of the non-fusible type and must plainly indicate whether they are in the open (off) or closed (on) position. They must have the means of being locked in the open position. Where fuses are used, they must be of the current limiting type (UL Class J).

17.4.6 Transformers

Transformer size must be based on connected load plus 20 percent allowance for load growth. Transformers must conform to UL energy efficiency, testing, and certification standards. All operator-owned or TJPA-owned transformers located within buildings, tunnels, or stations must be air-cooled, vacuum-pressure-impregnated, dry-type. Transformers located outside of buildings may be oil cooled if provided by the utility company.

17.4.7 Conduit and Raceway

Common conduit/raceway systems must be provided to organize wiring, where practical and feasible. Conduit must be concealed as far as practicably possible. Exposed wiring or conduit serving lighting, public address speakers, electronic message boards, ticketing machines, and CCTV systems is not permitted.

Conduit and raceways may be of the following types.

- Galvanized rigid steel conduit
- Intermediate metallic conduit
- Cable tray (galvanized rigid steel or aluminum)
- Fiberglass
- PVC ([polyvinyl chloride)

Encased conduit elbows and stub-ups must be type rigid galvanized steel (RGS) or intermediate metallic conduit. All exposed conduit work, indoors or outdoors, must be rigid galvanized steel. Final connections to devices and motors, which may vibrate or require provisions for movement, must be made with liquid-tight flexible conduit.

Fiberglass and PVC conduit must only be used when encased in concrete, with a minimum of 2 inches of concrete cover.

Materials manufactured for use as raceways, conduits, ducts, and their surface finish materials must be capable of withstanding temperatures up to 932°F for a minimum of one hour (except where encased in concrete) and must conform to the NEC. The materials must also conform to NEMA, ANSI, and UL standards.

Raceways for normal and emergency power circuits must be physically separated to the maximum extent possible except in equipment rooms or where necessary to connect at common equipment.

One empty spare conduit with a pull cord must be provided for each conduit crossing beneath the tracks. Spare conduits must be the same size as that installed.

17.4.8 Duct Banks

Duct banks must be configured as required at the specific location. Manholes, pullboxes, junction boxes, and cable vaults must be spaced for ease of cable pulling and must meet applicable codes and operational

requirements, without exceeding cable-pulling tensions. Power and communications ducts and ducts with power cables rated over 1000 V must have separate manholes.

Concrete encased wayside duct banks must have a 3-inch minimum protective cover on all sides.

The radius of bends in conduits within a duct bank must be a minimum of 3 feet, regardless of size, and in conformance with manufacturer's recommendation.

Underground duct banks must be sloped toward a manhole or box from which water may be drained or pumped. A sump pit in the manhole must be designed for collection of water and pump ejection.

Manholes must include sufficient space to maneuver, pull, and rack cables. Manholes must contain pulling eyes, ground rod, cable racks, a ladder, a cast steel frame, a cast steel lid, and a lid locking mechanism.

The design must be carefully coordinated with underground utilities to assure safe access within the right-of-way. Manholes spacing must not exceed 500 feet.

17.4.9 Receptacles

Receptacle faceplates and switches must be of consistent appearance throughout the DTX facilities.

Public Areas

Receptacles in public areas must be of specification grade, weatherproof, GFCI (ground-fault circuit interrupter) construction and NEMA 20 R configuration, unless noted otherwise. The spacing of duplex receptacles must allow a 100-foot extension to reach all public areas. Adjacent receptacles must not be placed on the same circuit. Receptacles in the free public area must be on dedicated circuit breakers.

Service Areas

Receptacles in service areas (e.g., equipment rooms, storage rooms, janitor rooms) must be of specification grade, weatherproof or non-weatherproof construction, and rated to meet service requirements. Configuration must be NEMA 20 R, unless otherwise noted. A minimum of one duplex receptacle for each 30 feet of wall space must be provided. Adjacent receptacles must not be placed on the same circuit.

Communications Room

Receptacles and lighting in communications rooms must be on separate circuits. A minimum of two 20-A, 120-V circuits must be provided for receptacles. A minimum of two 20-A, 277-V circuits must be provided for lighting.

Elevators and Escalators

Elevator machine room area lighting and receptacle circuits must be a separate 20-A, 120-V circuit. A cathodic protection circuit for the elevator must be on a separate 20-A, 120-V circuit. The 120-V circuits must be terminated in a weatherproof outlet box.

Weatherproof GFCI duplex, 20-A, 120-V receptacles must be provided in elevator pits and in escalator upper and lower pits.

17.4.10 Station Kiosks

Separate utility metering must be provided for each kiosk. Metering must be connected on the utility side of the station power. Each kiosk must be provided with minimum of three 2-inch-diameter conduits.

17.4.11 Cables

Low voltage power cables rated 600 V or below and medium-voltage power cables for cables rated above 600 V and up to 15 kV must meet the requirements in subsections 600 V Single-Conductor Cable through 0, below. All conductors must be insulated except ground wire, which may be bare.

600 V Single-Conductor Cable

Conductor material must be stranded or solid copper meeting the requirements of ASTM B3.

Conductor type

Conductor types must be as follows:

- Size 12 AWG and smaller: Solid conductor
- Size 10 AWG and larger: Class B stranded
- Size 14 AWG to Size 1/0 AWG: CEC, Type THHN or THWN, PVC thermoplastic insulated in conformance to NEMA WC5. Cable must be jacketed with clear polyamide nylon over the insulation.
- Size 2/0 AWG and larger: CEC, Type RHH, ethylene-propylene rubber (EPR)-insulated in conformance to NEMA WC 8

Temperature rating. The temperature ratings of all 600 V single-conductor cables must be not less than 167°F.

Fire-retardant properties. Power cable for emergency fans and related equipment and emergency lighting cables must pass the flame propagating criteria of IEEE 1202 and have a minimum circuit time of 5 minutes in the flame test of IEEE 1202; a type test certificate is required with every shipment of cables. Power cables in tunnel areas must be of low-smoke-zero-halogen type.

Insulation rating. The insulation rating must be 600 V.

600 V Multiple-Conductor Cable

Multiple-conductor cable conforming to NEMA WC 5, approved for use in cable tray, must be provided.

Multiple-conductor cable for all power applications, except receptacles when installed in cable tray for sizes up to 4/0 AWG, must be provided.

Insulation must be as specified in subsection 600 V Single-Conductor Cable, for a single-conductor cable. The cable must be jacketed over the insulation.

A multiple-conductor for the control wire must be, at a minimum, 14 AWG stranded copper.

The insulation rating must be 600 V.

Multi-conductor cable must be made by assembling individual or twisted pairs of insulated conductors into a tight cylindrical form using fillers that are compatible with other materials in the cable.

Power cables in tunnel areas must be of low-smoke-zero-halogen type. .

Medium-Voltage Cable

Medium-voltage power cables must consist of stranded copper conductors with a semi-conductive screen, EPR insulation, an insulation screen, metallic tape shield, a polyester film, and an outer jacket. The cable insulation and semi-conductive screens must be manufactured by a single-pass, triple-tandem extrusion.

Voltage rating. The voltage rating of the AC power cables must be 5 kV, 15 kV, and 34.5 kV at 133 percent insulation level.

Insulation. The insulation must be EPR and must meet all the requirements of NEMA WC 8. The insulation for the cable must have a minimum average thickness as determined by the conductor size.

The cable must be certified as passing the flame test specified in IEEE 383 Article 2.5.

Splicing. Where required, splicing must use materials of equivalent insulation type.

17.5 Lighting

The lighting criteria herein outline the design requirements for quantity of illumination, quality of illumination, and system components. Lighting systems design must conform to CCR Title 24, Part 1, Article 1, “Energy Building Regulations”; CBC Title 24; and IESNA lighting standards, including mandatory conservation requirements. All wiring materials and installations within the DTX tunnel must conform to the requirements of NFPA 130.

Lighting and associated control systems must include

- External roof lighting
- Interior open floor lighting
- Egress and access entrance lighting
- Safety exit sign lighting
- Perimeter street lighting
- Perimeter sign lighting
- Tunnel lighting

Lighting control must be designed to use energy efficiently. Automatic and manual control arrangements must ensure efficient utilization of energy and maintenance procedures.

17.5.1 Fourth and Townsend Street Station and Ancillary Structure Lighting Requirements

The subsection, Quantity of Illumination, through subsection Emergency Lighting and Exit Signs, following, contain the lighting requirements for the Fourth and Townsend Street Station, ventilation and egress structures, and ancillary buildings.

Quantity of Illumination

Illumination levels must define and differentiate between task areas, decision and transition points, and areas of potential hazard. Proper illumination must promote the perception of greater security among passengers. Platform lighting is essential to the safety and security of station facilities and must increase the safety of the passengers as they board and de-board trains.

The illumination levels must conform to Table 17-1.

Table 17-1: Illumination Levels for Fourth and Townsend Street Station and Ancillary Structures

Location	Average Normal Illumination Level
Station entrances/exits	10 foot-candles
Mezzanine, waiting area and boarding platforms	15 -20 foot-candles
Stairs, escalators and elevators	10 -20 foot-candles
Public toilets	25-30 foot-candles
Ticket vending machines	50 foot-candles
Station agents booth	50 foot-candles
Offices	30 foot-candles
Equipment and control rooms	20 -30 foot-candles
Janitorial rooms/lockers	15 foot-candles
Storage rooms	20 foot-candles

Levels indicated must be at a plane 18 inches above floor level.

Lighting of station platform and concourse levels must be direct. Uplighting is acceptable for lighting the ceiling only and must not be used to light the floor level. Minimum average maintained foot-candle levels within stations and in similar rooms must conform to IESNA standards.

Illumination of emergency lighting must conform to section 0.

Brightness and Glare

Luminaries must be selected, located, and aimed to accomplish their primary purpose while producing a minimum of objectionable glare. Care must be exercised to prevent specular reflection on signage, direct glare from exposed lamps, high brightness areas of individual fixtures, and reflections in glazing or other specular surfaces.

Uniformity

The uniformity ratio of average to minimum levels must not exceed 3:1.

Color Temperature

Lamps of the same type within each area of illumination (e.g., room, yard, tunnel) must have the same color temperature. In areas where different types of lamps are required (e.g., metal halide, high-pressure sodium, fluorescent), the color temperature of each type must be matched closely to provide uniform color.

Site Glare Control

Special care must be taken to avoid objectionable glare to streets and adjacent property. Luminaires must be positioned to minimize spill light. Luminaires must be provided with internal shielding and located to prevent spill light and glare in the direction of neighboring residential or commercial properties. Luminaires placed within 50 feet of elevated freeways and overpasses must be designed to provide absolute cutoff in the direction of moving traffic.

The design must meet or provide lower light levels and uniformity ratios than those recommended by IES Recommended Practice Manual, Lighting for Exterior Environments (RP-33). The exception must be that in no case must light levels be less than 5 foot-candles at the walkway.

Exterior lighting must be designed such that all exterior luminaires with more than 1,000 initial lamp lumens are shielded, and all luminaires with more than 3,500 initial lamp lumens must meet the full cutoff IESNA classification.

The maximum foot-candle value of all interior lighting must fall within the building (not outward through windows), and the maximum foot-candle value of all exterior lighting must fall within the property.

Any luminaire within a distance of 2.5 times its mounting height from the property boundary must have shielding such that no light from that luminaire crosses the property boundary.

Emergency Lighting and Exit Signs

Emergency lighting systems must be designed, installed, and maintained in conformance to OSHA standards and provide a minimum of 2 foot-candles of floor-level illumination.

Exits must be marked with readily visible signs complying with the requirements of the CBC.

Illuminated exit signs must be supplied from the emergency lighting system. Emergency fixtures, exit lights, and signs must be separately wired from the emergency distribution panels. Wiring for exit sign control must terminate in a weatherproof junction box at sign locations.

Emergency lighting design for stairs and escalators must emphasize illumination on the top and bottom steps or landings. All escalator steps, newel, and comb lighting must be on emergency power circuits, in conformance to NFPA 130. A minimum of 1 foot-candle of emergency lighting must be provided at floor level throughout the entire run of each stair and escalator. Wall pack units, where used, must be equipped with self-testing features.

17.5.2 Tunnel Lighting Requirements

Quantity of Illumination

Lighting must be provided in all tunnels. Lighting must conform to the requirements of NFPA 101 and NFPA 130. The lighting at walkway surfaces must not be less than 1 foot-candle of illumination in at least the following locations.

- Within emergency exits
- Within subways at exit doors, threshold, walkway stairs, walkway ramps, and crosswalks
- All other means of egress walking surfaces

Circuiting of Walkway Lighting Fixtures

Tunnel walkway lighting fixtures must be powered from two alternating electrical power sources (i.e., every other fixture powered from the same electrical power source).

Emergency Exits

Yellow lights must be installed above tunnel exit doorways. Yellow lights must have two lamps, each supplied from separate feeder circuits.

Blue Light Stations

Requirements for blue light station locations are defined in CHAPTER 15, FIRE-LIFE SAFETY, and CHAPTER 18, Rail Systems.

Blue light stations must be supplied from alternate power sources, so that loss of power to a blue light station must not result in power loss to adjacent blue light stations.

A 120-VAC duplex outlet must be provided at each blue light station. Each outlet must be provided with 15-A service.

Emergency Lighting and Signage

Tunnels must be provided with an emergency lighting system in conformance to NFPA 101. Emergency lighting must not be less than 0.25 foot-candles measured at walkway floor level.

Illuminated exit signs must be supplied from the emergency lighting system. Emergency fixtures, exit lights, and signs must be separately wired from the emergency distribution panels. Wiring for exit sign control must terminate in a weatherproof junction box at sign locations.

17.5.3 Equipment

All luminaries and lamp types must be standardized systemwide to provide design and perceptual unity and simplify maintenance requirements. All site lighting fixtures should be waterproof and vandal-resistant and have tight gaskets to prevent the infiltration of dust. Luminaries must function effectively for a minimum of 20 years, allowing for routine maintenance.

Selection of ceiling fixtures must consider the use of open lenses for the maximum use of direct lighting.

Lighting fixtures in tunnels must be UL-listed for operation in a wet environment.

Lamp Application

Lamp applications must meet the following requirements:

- Interior and exterior platform and concourse: LED, fluorescent (if existing)
- Concession areas: High CRI (color-rendering index) fluorescent
- Displays: High CRI fluorescent
- Accent: Incandescent or compact fluorescent
- Ancillary rooms and vent structures: Interior fluorescent or metal halide
- Exterior: LED
- Walkways, sidewalks, and street crossings: Metal halide
- Vault and pit areas: LED with wire guard, suitable for wet locations

Lamp Types

All new lamps must be LED type. Fluorescent and compact fluorescent, metal halide, and high-pressure sodium may be used to replace existing lamps in-kind.

Lamps for Type T8 fluorescent lighting must have reduced mercury contents that meet the USEPA toxic characteristic leaching procedure test for non-hazardous fluorescent light waste pursuant to 22 CCR Section 66260.200(e). The soluble concentrations of the inorganic constituents, as measured by the toxic characteristic leaching procedure pursuant to Title 22, CCR, Section 66261.24(a), must be below the established regulatory thresholds.

Incandescent. High-efficiency and long-life type for limited use only.

Fluorescent ballast (existing condition only). Fluorescent ballast must be electronic integrated circuit, solid-state, full-light-output, energy-efficient type, compatible with lamps and lamp combinations to which it is connected. Type must be Class P, high power factor, (minimum 90 percent). Total harmonic distortion of ballast current must be less than 10 percent and conform to CFR 47 for electromagnetic interference.

LED drivers. LED drivers must accept 277 VAC or 120 VAC and be rated for either interior or exterior applications.

17.6 Electrical Systems Instrumentation and Controls

Medium-voltage electrical equipment must be controlled by a direct current source backed-up by battery. Where practical, gauges and instruments on electrical equipment must be microprocessor-based multi-functional.

Sump pump control must be standard for operation with high-water alarm controls.

17.7 Grounding

The grounding of systems and equipment must conform to listed codes. Grounding resistance to earth must not exceed 5 ohms, as measured by the fall-of-potential method. Grounding connections must not be made on mechanical and utility pipes (including water) on the service side of dielectric couplings.

Grounding for passenger stations (and facilities) must consist of a ground system under each facility comprising a buried, exothermically welded grid and rod system or concrete-encased electrode. All metal components/materials of transit facilities and within 15 feet of centerline of track including shelters, fences, poles, guardrails, handrails, doors, metallic benches, and bollards that are susceptible to contact by patrons or maintenance personnel and likely to become energized by falling overhead contact wire, must be electrically bonded to the ground electrode. Ground electrical raceways, fittings, and equipment as required by NFPA 70 (NEC). The grounding grid scheme for electrically conductive or metallic materials running along the alignment must be developed to minimize the flow of stray currents and limit touch potentials to safe levels.

All electrically conductive materials used near the platform edge (e.g., platform edge nosing and end-of-platform gates) must be isolated from electrical ground. Any exposed, electrically grounded, metallic elements on the platform must not be closer than 6 feet to the platform edge.

17.8 Load Flow Analysis

Power system analyses must verify that all equipment is rated for the voltage, ampacity, and fault duty to which it is exposed and that the system will operate satisfactorily for both initial and projected electrical power capacity requirements with regard to the quantity, quality, and reliability required for the electrical distribution system equipment. Load calculations must include normal loads, emergency loads, and essential loads.

Power system analyses must include short-circuit calculation, overcurrent protective device coordination, arc flash analysis, and load flow evaluation. Calculations must use the most recent version of SKM PowerTools for Windows software, or ETAP software.

The short-circuit analysis must begin at the utility company's primary fault current side, with current and impedance values obtained from the utility company. Device interrupting ratings must be based on the short-circuit calculation. Overcurrent protection devices must be selectively coordinated in the report. Arc flash analysis must be based on the most recent version of IEEE 1584 and NFPA 70.

Load-flow analysis (study) must prove all cables have adequate capacity and all voltage drop tabulations are within tolerances. The overall power system report must include the following:

- Study overview and utility company data
- Executive summary
- Recommendations
- Short circuit summary table
- Computer output data (short circuit calculations, cable impedances)
- Single line diagram with utility information, interrupting ratings, device information cable sizes and lengths
- Protective device setting table

- Time current curve (log-log) plots
- Arc flash analysis table with incident energy tabulations, device opening times, panel and switchgear information
- Voltage drop tables listing percent voltage drop at the bus area and the cable reference

The study must also provide arc flash labels. Arc flash labels must be OSHA-, NFPA 70-, and IEEE 1584-compliant. Computer-generated labels must include the following information:

- Arc flash boundary
- Incident energy level in calories/in^2
- Personal protective equipment required
- Shock risk voltage
- Glove class
- Limited approach
- Restricted approach
- Study company and date
- Equipment name and upstream protective device

The study must be approved by the TJPA prior to label printing. Labels must be installed.

Lighting analyses must verify that the number, type, and placement of lighting fixtures must meet the criteria for the quantity. Calculations must be based 6 inches above the finished grade, with an assumed light loss factor of 0.75. Lighting manufacturers' computer software must be used in the calculations. Analysis must include point-to-point print-outs adequately sized (either 11 x 17-inches or 24 x 36-inches) for readability. The analysis must include a table with average maintained foot-candle values of each light fixture type.

Other calculations, such as those for conduit jam analysis and cable-pulling tension, must verify that the geometry of raceways will allow for the proper installation of wire and cables within the parameters specified by equipment and material manufacturers. The analysis must also verify that conduit fill calculations conform to NEC guidelines and do not exceed over 40 percent conduit fill, or as specified by the authority having jurisdiction.

CHAPTER 18 RAIL SYSTEMS

SCOPE

This chapter establishes the requirements for the traction power supply and distribution system, voice and train control communications system, and signals and train control system for the Downtown Rail Extension (DTX).

The DTX will be an extension of the existing Caltrain system under the Peninsula Corridor Joint Powers Board (Caltrain) Peninsula Corridor Electrification Project (PCEP). Correspondingly, the design of the DTX rail systems must be compatible and consistent with the PCEP design and must conform to the PCEP Design Criteria. Rail systems design must reference the following chapters of the PCEP Design Criteria:

- Chapter 15: Rolling Stock
- Chapter 20: Traction Power System (TPS)
- Chapter 21: Overhead Contact System (OCS) and Traction Power Return System
- Chapter 22: Grounding and Bonding Requirements
- Chapter 23: Corrosion Control
- Chapter 24: Signaling and Train Control
- Chapter 25: Grade Crossings
- Chapter 26: Electromagnetic Compatibility and Interference
- Chapter 27: Supervisory Control and Data Acquisition (SCADA)
- Chapter 28: Communications

The design of DTX rail systems must be coordinated with Caltrain and California High-Speed Rail Authority (CHSRA) infrastructure. Signaling, traction power, and train control must be interoperable and fully integrated with the Caltrain electrified corridor.

The criteria and guidelines provided in this chapter supplement the Caltrain Engineering Standards and PCEP Design Criteria.

CODES, STANDARDS AND GUIDELINES

The design of the communications systems for the DTX must conform to the latest edition of the following codes, standards, and guidelines, if not established in the Caltrain Design Criteria:

- American Institute for Steel Construction Manual of Steel Construction
- American National Standards Institute (ANSI)
- American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering
- American Welding Society (AWS), Standard D.1.1, Structural Welding Code
- ASTM International

- California Building Code
- California Electrical Code
- California High-Speed Rail Authority (CHSRA) Design Criteria Manual
- California Public Utilities Commission (CPUC) General Orders (GO):
  - GO 26-D, Regulations Governing Clearances on Railroads and Street Railroads with Reference to Side and Overhead Structure Parallel Tracks, Crossings of Public Roads, Highways and Streets
  - GO 95, Rules for Overhead Electric Line Construction
  - GO 118-A, Regulations Governing the Construction, Reconstruction, and Maintenance of Walkways Adjacent to Railroad Trackage and the Control of Vegetation Adjacent Thereto
  - GO 128, Rules for Construction of Underground Electric Supply and Communication Systems
  - GO 176, Rules for Overhead 25 kV AC Railroad Electrification Systems for a High-Speed Rail System
- Institute of Electrical and Electronics Engineers
- Insulated Cable Engineers Association
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
  - NFPA 70, National Electrical Code (NEC)
  - NFPA 101, Life Safety Code
  - NFPA 110, Standard for Emergency and Standby Power Supply Systems
  - NFPA 130, Standard for Fixed Guideway Transit and Passenger Railway Systems
  - NFPA 780, Standard for Lightning Protection Systems

In addition to the specific codes, standards, and guidelines listed , other local, state, and national codes, regulations, or rules may be applicable to any aspect of the design, as set forth in this chapter.

18.1 Power Distribution System

18.1.1 Traction Power Cable Support and Conduit Systems

Traction power cables from the 25 kV AC feeder breaker connections or disconnect switch terminals and rail return cables from the return bus connections must be installed in appropriate raceways including conduits or concrete-encased duct banks. Cable trays may be used only in areas where approved by the Transbay Joint Powers Authority (TJPA). Conduit and cable trays, where approved for use, must conform to the requirements provided in CHAPTER 17Electrical Systems.

Exposed conduit must be galvanized rigid steel, which will be grounded to the station ground bus. All conduits will be sized to provide adequate spare capacity, and the radius of bends must be sufficient to maintain cable sidewall pressures within manufacturers' recommendations during pulling, especially for high-voltage cables with shields. All conduits will terminate in end-bells where the duct lines enter vaults.

Where approved for use, cable trays will provide adequate cross-sectional area to permit a neat alignment of the cables and avoid crossing or twisting. The comingling of high-voltage cables with low-voltage cables in

trays is prohibited. High- and low-voltage cables may be laid in the same tray if separated by a non-conductive barrier.

Cables in manholes must be supported on non-metallic racks or fiberglass cable support insulators. Such supporting arms or racks must be spaced to avoid excessive weight or pressures on the cable insulation. The cables must be arranged in not more than one layer.

18.1.2 Traction Power Load Flow Calculations

It is anticipated that the most northerly traction power facility in the PCEP will be a paralleling station (PS-1), which will be constructed next to the proposed Common Street grade crossing at Caltrain milepost 1.27.

The DTX design, through a series of traction power load-flow and power supply calculations, must determine whether PS-1 can provide sufficient traction power to the DTX. Load flow analyses must consider Caltrain and CHSRA operations under both normal and degraded conditions.

The calculations must be based on the parameters for rolling stock provided in CHAPTER 2, OWNER'S REQUIREMENTS.

18.1.3 Traction Power Facility Data

The proposed traction power facilities for the PCEP and their locations are shown in Table 18.1.

Table 18-1: PCJPB Traction Power (TP) Facilities

TP Facility		Location (by milepost)		Notes
Label	**Type**	**Civil**	**Uniform System**	
PS-1	Paralleling Station	1.27	1.27	
PS-2	Paralleling Station	4.95	4.95	
TPS-1	TP Substation	9.65	9.69	ph-ph SC Level = 1900 MVA
PS-3	Paralleling Station	15.02	15.06	
PS-4	Paralleling Station	20.05	20.09	
SWS-1	Switching Station	26.62	26.66	
PS-5	Paralleling Station	33.55	33.59	
PS-6	Paralleling Station	38.85	38.89	
TPS-2	TP Substation	45.75	45.19	ph-ph SC Level = 2500 MVA
PS-7	Paralleling Station	51.0	50.44	

Each traction power substation is assumed to have two 115/50 kV (2 x 26.25 kV) transformers, each feeding a separate electrical section. A 26.25 kV no-load secondary voltage (52.5 kV feeder to OCS) is also assumed.

The high-voltage transformers will have a rating of 60 MVA, with 10 percent impedance.

At paralleling stations, a single 50/25 kV autotransformer will be assumed, rated at 10 MVA, with 1.2 percent impedance. The same parameters will be assumed on each side of the switch break at the switching station.

18.2 Overhead Contact System

The DTX OCS design must conform to the Caltrain PCEP Design Criteria and CPUC GO 176.

18.2.1 Design Requirements

The design of the DTX electrification system must conform to the following requirements in subsections Environmental Conditions and Maximum Authorized Speed, below.

Environmental Conditions

See CHAPTER 4, Environmental Requirements, for specific environmental conditions applicable to the DTX project.

The OCS design for below-grade sections of the DTX must accommodate the environmental conditions provided in Table 18.2.

Table 18-2: Environmental Conditions for Below-Grade OCS Design

Condition	Operating	Non-operating
Minimum air temperature	40°F*	n/a
Normal air temperature	68°F*	n/a
Maximum air temperature	95°F*	109°F*
Ice on conductors	none	none
Wind	none	none
Maximum wire temperature	145°F**	n/a

* *Temperature considered without solar heating or wind effects.*

** *Maximum wire temperature is the continuous operational wire temperature without solar heating or wind effects.*

Maximum Authorized Speed

The OCS must accommodate at least the maximum authorized speed within the project limits, as defined in Chapter 7, GUIDEWAY GEOMETRICS.

18.2.2 OCS Wire Particulars

All wires and cables associated with the DTX OCS must match those used for the Caltrain PCEP. See the PCEP Design Criteria and drawing W6001 "Electrification Project Overhead Contact System – Catenary Wires.

18.2.3 Overhead Line Loading

Do not consider wind loading in the design of the below-grade sections of the DTX.

18.2.4 Foundations

Foundation design must conform to the recommendations of the DTX geotechnical reports referenced in Chapter 9, GEOTECHNICAL REQUIREMENTS.

18.2.5 Clearances

Horizontal and vertical clearances must conform to the requirements of section 7.3 and must also satisfy CPUC GO 26-D.

18.2.6 Electrical Clearances

The design for fixed termination components of the OCS must provide for live-to-ground electrical clearances, as provided in Table 18.3. The electrical clearances may only be adopted with the approval of the TJPA and must be maintained under all defined climatic conditions. The design must accommodate a pantograph head width ranging between 4 feet 9 inches and 6 feet 6 inches (horn tip to horn tip).

Table 18-3: Live-to-Ground Electrical Clearances

Clearance Category	Static	Passing
Normal	10.5 in.	8 in.
Minimum	8 in.	6 in.

18.2.7 Electrical Requirements

Within the DTX tunnel, sectionalizing of the OCS must conform to requirements of NFPA130, such that the traction power blocks are coordinated to be coincident with the signaling system and ventilation zones.

Disconnect Switches. must conform to PCEP Design Criteria. The OCS will be equipped with disconnect switches at all primary feeding and bypass feeding locations and monitored by supervisory control and data acquisition system. See CHAPTER 19, Communications. All disconnect switches must be motor operated, capable of remote operation and of local motorized or manual operation.

18.2.8 Mechanical Requirements

OCS Type. The OCS for the at-grade portion of the DTX must be simple catenary (messenger and contact wire), automatic tension (A.T.) system and conform to the PCEP Design Criteria. The below-grade portion of the DTX must be low-profile, simple catenary, fixed termination (F.T.) system.

Staggers, Tensions, Sags and Spans. OCS conductor tensions, wire sag, and span length design must conform to the requirements established by the AREMA Manual for Railway Engineering, Chapter 33, NESC, and CPUC GO 176.

Along-track movement of the OCS and the resulting stagger change due to pivoting of registration assemblies is not anticipated to be significant, as the total temperature range is limited. Therefore, upper- and lower-temperature stops to limit along-track movement of the conductors are not required. However, a safety stop must be fitted in any at-grade A.T. OCS design to limit the travel of the balance weights in the event of a broken-wire condition.

The OCS conductors and wires must be designed using tensioning parameters that obtain the lowest structural loading consistent with acceptable current collection and performance. The OCS design tensions, sags, and spans must be compatible with the selected catenary configuration for either the F.T. or A.T. types.

OCS Tension Lengths. Splicing of OCS conductors will not be permitted during initial construction, and therefore the limits for the wire length for the F.T. equipment in the below-ground section of the DTX must be based on the manufacturing process or the reel length. The reel length will be determined by suppliers, and the design must be developed accordingly.

Overlaps, Turnouts and Crossovers. Insulated overlaps will be used to the greatest extent practical for sectionalizing purposes. In the event that an insulated overlap is not physically feasible or practical, a section insulator may be used instead.

The interface between at-grade A.T. OCS and below-grade low-profile, simple catenary, F.T. system must be designed such that temperature variations will not create hard points in the transition overlap.

Wire Heights and Gradients. Contact wire height (CWH) is the distance between the underside of the contact wire and the top of rail (TOR); CWH is measured along the projected centerline of track in conditions where the track is superelevated. The absolute minimum CWH for below-grade portions of the DTX will be 17 feet 5 inches.

Contact wire gradients must not exceed 1.3% for below-grade portions of the DTX.

18.3 Voice Radio

Due to the fact that the tunnel alignment includes multiple horizontal curves, radiating coaxial cable must be used in the DTX tunnel instead of tunnel radios. The design and implementation of radiating coaxial cable must conform to the PCEP Design Criteria.

18.4 Signals and Train Control

The design of the DTX voice and train control system must be compatible and consistent with Caltrain's design standards and include bi-directional communications to the CHSRA's operations control center to relay all fault codes and health and diagnostic voice, video, and text messages. Operational data will be shared to ensure performance metrics such as punctuality and timetable adherence are met across the blended network to facilitate delay attributions amongst owners and operators in the event of service perturbation.

Caltrain has implemented a positive train control (PTC) system upgrade of its signal and train control system. The PTC system will consist of wayside, vehicle, office, and communication systems that work in concert to provide for the safe operation of the Caltrain system.

All tracks within the DTX project limits must be signaled for reverse running.

Transit Center platforms signals must allow for adding and cutting cars.

Signal block design must be coordinated with the tunnel ventilation design to meet the criteria of the maximum number of trains in each ventilation section. See CHAPTER 16, Mechanical Systems.

18.4.1 Traction Current Return

Trains operating on the DTX alignment must be provided with 25 kV of electrical energy via the OCS. Return energy is deposited on the track through the trains' wheels. Connection to the rails is necessary to provide a path to return energy back to the power source and distribute the energy along adjacent rails, thus increasing the ampacity of the system. The train detection system residing on the rails needs to be isolated from these rail connections and avoid potential sneak paths that could cause a false clear.

The primary method for isolation is in the use of impedance bonds. These devices provide very low impedance to the propulsion current and relatively higher impedance to the train control system. Impedance bonds are used at cut sections where insulated joints separate track circuits at track circuit boundaries and interlockings. They are also located where the traction current return is taken back to the power source. These are typically placed at cut sections, but not in all cases. In addition to provisions for impedance bonds, train detection equipment must protect against incompatible traction return current such alternating current immune relays and filters.

In propulsion terms, all the rails are connected where current is returned to the supply, the signal system being isolated from the current by the impedance bonds. In addition, the rails are connected at intervals to provide balance of the propulsion system as well as increase ampacity. These are known as cross-bonds. There must be a minimum of two track circuits with cut sections between cross-bonds. There must be a minimum of three track circuits with cut sections between cross-bonds if one includes a return to the propulsion system.

Impedance bonds must be provided at the ends of track circuits leading from electrified tracks to non-electrified tracks to bleed-off the return current. The center tap of the impedance bond at the non-electrified end will be connected to the static wire or to the center of an impedance bond on the adjacent electrified track. Impedance bonds are not required at insulated joints within crossovers or on track circuits that are wholly within non-electrified tracks.

Impedance bonds must provide adequate impedance for the steady energy track circuits, electrified Electro Code, and any audio frequency track circuits that are located within the boundaries of the track circuit. The neutral leads between adjacent impedance bonds must be designed in a manner that will minimize the likelihood of theft.

The actual ratings of the impedance bonds must accommodate the absolute value of the return current as required by the traction power designer.

The signal designer must work with the traction power designer in developing the cross-bonding scheme for traction power return conductors attached to impedance bonds. The cross-bonding plans must be provided by the signal designer.

18.4.2 Tunnel Operations

The DTX tunnel is made up of several ventilation zones. Only one train will be allowed in a ventilation zone at any one time. The locations of the signals must be coordinated to be in concert with this requirement. The signal designer must coordinate this work with operational planning and tunnel ventilation groups. The DTX PTC must be fully integrated with Caltrain's existing PTC system.

CHAPTER 19 COMMUNICATIONS

SCOPE

This chapter establishes the requirements for communications systems and the supervisory control and data acquisition system for the Downtown Rail Extension (DTX). These criteria apply to the following facilities:

- DTX tunnel
- Transit Center train box fit-out
- Fourth and Townsend Street Station
- Ventilation and egress structures
- Ancillary structures
- Existing Caltrain facilities serving as primary head end for communication systems and supervisory control and data acquisition (Menlo Park Control Center and San Jose Control Center)

The criteria and guidelines in this chapter supplement the latest version of the following Caltrain standards:

- Caltrain Engineering Standards
- Peninsula Corridor Electrification Project (PCEP) Design Criteria

Any discrepancies or inconsistencies between the respective criteria must be brought to the attention of the Transbay Joint Powers Authority (TJPA) for resolution. The requirements of the communications systems must be coordinated with the requirements contained in the following chapters:

- Chapter 15: Fire-Life Safety
- Chapter 17: Electrical Systems
- Chapter 18: Rail Systems

CODES, STANDARDS AND GUIDELINES

The design of the communications systems for the DTX must conform to the latest edition of the following codes, standards, and guidelines if not established in Caltrain's design criteria:

- American National Standards Institute (ANSI) publications, all applicable sections
- Americans with Disabilities Act (ADA)
- California Building Code (CBC)
- California High-Speed Rail Authority Design (CHSRA) Design Criteria Manual
- Electronic Industries Association/Telecommunications Industry Association (TIA) standards
- Institute of Electrical and Electronics Engineers publications, all applicable sections, including the National Electrical Safety Code (NESC)

- National Fire Protection Association (NFPA) publications:
  - NFPA 70 – National Electrical Code
  - NFPA 101 – Life Safety Code
  - NFPA 130 – Standard for Fixed Guideway Transit Systems
- San Francisco Electrical Code
- Code of Federal Regulations (CFR), Title 47, Telecommunication Regulations, all applicable sections
- Underwriters Laboratories Inc.

19.1 Operations Technology Network

The DTX operations technology network must comprise a fully redundant, no single-point-of-failure, communications fiber-optic backbone that interfaces with Caltrain's interoperable electronic train management system/positive train control system and conforms to the PCEP Design Criteria. The DTX operations technology network design must eliminate network delays and outages because of network spanning tree convergence.

The DTX design must provide a backbone loop throughout the DTX alignment, including the Transit Center train box fit-out, tunnel, and Fourth and Townsend Street Station.

The DTX backbone loop must be connected to the Caltrain wide area network at the current Caltrain station at 4th and King streets.

19.2 Conduits, Ducts, and Raceways

Conduits, ducts, and raceways must conform to the PCEP Design Criteria.

19.3 Public Address System and Talking Sign

A public address system conforming to the Caltrain Design Criteria must be provided in the Transit Center train box fit-out and Fourth and Townsend Street Station and provide clear, audible, announcements to passengers. The PAS must have speakers located along boarding platforms. The PAS speakers in the Fourth and Townsend Street Station must be wall mounted.

Talking signs for persons with visual impairments conforming to the Caltrain Design Criteria must be provided at the Transit Center and the Fourth and Townsend Street Station. The talking-sign system must comprise an American with Disabilities Act-compliant multipoint, closed-radio system that provides a trail of audible information to an individual user on the direction to go and turn to arrive at a particular train departure location.

19.4 Closed Circuit Television

A closed-circuit television system conforming to the PCEP Design Criteria must be installed throughout the DTX facilities. Coverage must include the following locations:

- Points of access to the DTX system including the tunnel portal and entrances to the Fourth and Townsend Street Station and Transit Center
- Station waiting areas including concourse and platforms
- Points of access to restricted areas, including entrances to ventilation and emergency egress structures and the specific owner and operator areas identified in Chapter 14, subsection 14.5Ventilation and Emergency Egress Structures
- Escalator and elevator boarding areas
- Elevator cabs
- Ticket vending machines and other fare collection systems
- Blue light stations
- Cross-passage doorways (only applicable in portion of tunnel with a partition wall)

Cameras located at tunnel entry and exit locations must have dedicated coverage. Station platforms must have overlapping coverage of all passenger-accessible locations.

19.5 Variable Message Signs

Variable message signs (VMS) conforming to the Caltrain Design Criteria must be provided.

A minimum of two VMS boards are required on each boarding platform for passenger convenience and for redundancy. The VMS boards will be located approximately one-third of the platform distance from each platform end.

The minimum vertical clearance from the platform floor to the bottom of the VMS board must be 8 feet. The tip of the VMS board must not be closer than 9 feet from the track centerline, and for maximum visibility, not more than 11 feet from the track centerline.

19.6 Telephone

The telephone system design must conform to the Caltrain Design Criteria and PCEP Design Criteria.

19.7 Voice Radio

The voice radio communications design must comply with the Caltrain Design Criteria and PCEP Design Criteria.

19.8 Intrusion Detection/Access Control

An intrusion detection/access control system is required and must monitor access to all entryways and exitways to non-public spaces. The doors to these spaces must have tamperproof magnetic locks with either mag-card activated-, insertion-, or swipe-type readers. The system must conform to Caltrain Design Criteria and PCEP Design Criteria.

19.9 Supervisory Control and Data Acquisition System

The supervisory control and data acquisition (SCADA) system for the DTX must meet the requirements of PCEP Design Criteria. Once Caltrain completes electrification, SCADA system communications will be relayed via a fiber-optic backbone. The SCADA for the DTX will be a stand-alone local area network that will be connected into the Caltrain wide area network as an extension.

Given that the DTX is principally underground, equipment unique to the DTX limits must also be communicated on the fiber-optic system including:

- Tunnel ventilation
- Traction power
- Sump pumps
- Intrusion alarms
- Fire alarms
- Blue light stations (including all appurtenances found at these locations)
- Cross-passage doorways (only applicable in portion of tunnel with a partition wall)

19.10 Automated Fare Collection System

Ticket vending machines for the Fourth and Townsend Street Station and Transit Center must be furnished, tested, and commissioned by Caltrain, be compatible with the Clipper system, and conform to the PCEP Design Criteria. Conduit, power, and foundation requirements must be installed as part of the DTX project. The locations of ticket vending machines and conduit must be coordinated with Caltrain.

CHAPTER 20 STRAY CURRENT AND CORROSION CONTROL

SCOPE

This chapter establishes the requirements for stray current and corrosion control measures and are applicable to all Downtown Rail Extension (DTX) engineering disciplines.

CODES, STANDARDS AND REFERENCES

The design of stray current and corrosion control measures for the DTX must conform to the latest edition of the following standards, codes, guidelines, and design criteria:

- ASTM International standards, ASTM C150, Standard Specification for Portland Cement
- National Association of Corrosion Engineers (NACE) standards
- Peninsula Corridor Electrification Project (PCEP) Design Criteria

20.1 General Design Requirements

The design of the stray current and corrosion control measures must ensure that the required service life of the DTX infrastructure is not compromised by corrosion-related problems or failures. These criteria are separated into three areas: stray current corrosion, soil corrosion, and atmospheric corrosion. Corrosion control measures must satisfy the following objectives:

- Prevent premature failure caused by corrosion
- Protect against detrimental effects to DTX facilities caused by stray direct current earth currents from other transit operations
- Be economical to install, operate, and maintain

Stray current and corrosion control designs must be coordinated to avoid conflicts and the risk of one measure rendering another ineffective.

20.1.1 Environmental Conditions

Specific environmental conditions applicable to the DTX project are presented in CHAPTER 4, ENVIRONMENTAL REQUIREMENTS. Additional testing requirements for soil corrosivity will be identified as necessary for corrosion control designs.

20.1.2 Survey

The DTX alignment must be surveyed to identify existing corrosion control measures in utilities, buildings, equipment, direct current transit system facilities, and large objects along the corridor. If considered necessary by the Transbay Joint Powers Authority (TJPA), field testing may be performed in areas of high concern.

Survey information must include the type of facility, relative location from the alignment, name and owner, existing corrosion measures, type of circuit used. These data must be stored in a database or spreadsheet and used as the baseline for existing conditions prior to the implementation of any stray current or corrosion control measures undertaken as part of the DTX project.

20.2 Related Documentation

Stray current and corrosion control measures must consider the design requirements of other engineering disciplines specified within this manual.

The documentation listed under *References*

in CHAPTER 9 must be considered during the course of the design of the stray current and corrosion control measures.

20.3 Grounding, Bonding and Lightning Protection System

All grounding designs must be coordinated with the measures specified herein to ensure that the respective designs do not conflict and render either system ineffective. Grounding and bonding must conform to the PCEP Design Criteria.

20.4 Stray Current Corrosion Control Mitigation

The designs must mitigate detrimental effects to DTX facilities caused by stray direct current and earth currents from other transit operations or adjacent structures or facilities owned by others.

20.4.1 Basic Requirements

Stray current control designs must provide a means to mitigate and monitor stray current activity produced by other sources on buried and embedded metallic structures of the DTX system. The basic requirements for stray current mitigation and monitoring control are to

- operate and maintain the mainline system with no direct or indirect electrical connections to direct current traction power distribution circuits of adjacent transit systems
- design underground pressurized metallic utilities owned by TJPA to include electrical continuity, protective coating, cathodic protection and appropriate monitoring facilities. Evaluate non-pressurized underground metallic utilities owned by TJPA on an individual basis to determine the need for stray current mitigation.
- establish electrical continuity of steel reinforcement in cast-in-place concrete structures by selective welding or mechanical coupling of the reinforcing bars (where determined necessary for stray current mitigation).
- provide accessible test facilities capable of monitoring stray current activity on the bonded reinforcement during revenue operations.

While utility owners and authorities having jurisdiction of adjacent light rail and mass transit systems are responsible for minimizing the impact of stray currents originating from their infrastructure on the DTX, the

designer must ensure that the DTX design and operation will mitigate the impact of adjacent direct current transit infrastructure by protecting DTX structures and equipment from direct contact with direct current system grounded elements such as anchors and foundations.

20.4.2 Underground Structures

Reinforcing steel in permanent cast-in-place underground structure inverts must be electrically continuous only where determined to be necessary for stray current mitigation from other sources or for grounding purposes. Where required, the minimum requirements for the reinforcing steel from the top of rail down must include

- welding or mechanical coupling of all longitudinal lap splices.
- welding or mechanical coupling of all longitudinal members to a transverse (collector) member at regular intervals, not to exceed 200 feet and at both sides of electrical (physical) breaks in the longitudinal reinforcing steel, such as at expansion/contraction joints.
- continuity across expansion/contraction joints be accomplished through the use of bond cables exothermically welded to collector bars on each side of a joint. The minimum bond cable size will be AWG #1/0 stranded copper cable.
- test facilities installed at each end of the structure and at select collector bar or expansion/contraction joint. Test facilities must consist of insulated copper wires, conduits, and enclosures, terminating at accessible locations or block-outs exposing bond cables. Test facilities must include embedded reference electrodes and must be configured for convenient monitoring of the magnitude of stray current on the bonded reinforcement.

The requirements for permanent structural steel members must be reviewed on an individual basis to determine the need for special measures, such as increased thickness, external coating system, electrical bonding, and cathodic protection.

20.5 Soil and Water Corrosion Control

The designs must consider the effect of corrosion on the specified design life objectives for buried structures. Corrosion control provisions are required for all facilities when failure of such facilities resulting from corrosion may affect safety or interrupt continuity of operations. The corrosivity of the underground environment must be evaluated based on information obtained from the geotechnical reports. Additional borings or testing must be identified if the available information is insufficient for an adequate assessment of the soil and groundwater corrosivity.

Protection of metal structures must include corrosion control techniques, such as coating, electrical isolation, electrical continuity, and cathodic protection. The designer must identify reinforced concrete structures that may be subject to attack by chlorides or sulfates and specify cement types in conformance with ASTM C150. For severe environments, supplemental cementitious materials, inhibitors or coatings may be required.

Structures that may be affected by soil and water corrosion must be identified. Typically, these include:

- Buried and at-grade reinforced concrete structures
- Metallic piping systems (water, fire water, sewage ejectors, etc.)
- Underground storage tanks

Consider the corrosion control measures for facilities owned by others in the design and coordinate with the owners of the facilities to avoid conflicts, such as interference with cathodic protection systems.

20.5.1 Materials and Structures

Reinforced Concrete Walls and Slabs

The design for concrete in contact with soils (excluding the tunnel liner) must specify

- the Type I cement, generally. Type II cement must be used if the soil pH is less than 5.5 or the sulfate concentration is between 1000 ppm and 2000 ppm. Type V cement must be used if the soil sulfate concentration exceeds 2000 ppm. In very severe exposure where the sulfate concentration exceeds 20,000 ppm, pozzolans will be added to the cement for additional protection.
- a maximum of 200 ppm chloride concentration in mixing water and admixtures combined.
- a minimum of 2 inches concrete cover on the soil side of all steel reinforcement where the concrete is poured within a form or a minimum of 3 inches cover where the concrete is poured directly against soils.

Non-metallic Materials

Plastics, fiberglass, and other non-metallic materials for pressurized piping can be used to aid in corrosion control. The corrosion control design must coordinate with the piping design to consider the following factors in the selection of proposed materials:

- Manufacturers' recommendations
- Mechanical strength and internal pressure limitations
- Elasticity/expansion characteristics
- Comparative costs
- Expected life
- Failure modes
- Local codes
- Experience with the proposed non-metallic material in similar applications

20.5.2 Coatings

Buried metallic structures requiring coatings must be provided with a bonded dielectric protective coating. Mill-applied coatings must be specified wherever possible with the use of compatible coating systems for field touchup and repairs. The corrosion control design must specify the surface preparation, application procedure, primer, number of coats, and minimum dry film thickness for each coating system. The use of polyethylene encasement will not be permitted where cathodic protection will be applied.

20.5.3 Electrical Isolation

The corrosion control design must establish the need for and the location of insulated flanges, spacers, couplings, and unions. Insulated fittings must have a minimum resistance of 10 megohms before installation;

they must be designed for compatibility with material carried, including pressure and temperature restrictions. No more than 2 percent of a test current applied across the insulating device can flow through the insulator. Wherever possible, a minimum clearance of 12 inches must be provided between new and existing metallic structures. Where field conditions prohibit a 12-inch clearance, the design must include special provisions, such as insulating spacers, to prevent electrical contact with the existing structures.

20.5.4 Electrical Continuity

Continuity bonds must be made with insulated copper cables attached by exothermic welds. Cable design must have a minimum of two wires per joint for redundancy. Bond cables must be sized so that the total resistance of the pipeline circuit does not exceed 120 percent of the theoretical resistance of the pipeline. The minimum continuity bond cable size must be AWG #6 stranded copper cable. All exothermic welds must be coated.

20.5.5 Cathodic Protection

Cathodic protection installations must conform to structure life objectives and NACE International standards. Sacrificial anodes must be used wherever possible to avoid corrosive interference effects with underground utilities. Impressed current rectifier systems must be used only when the use of sacrificial anodes is not technically or economically feasible impressed current systems must be designed using variable voltage and current output rectifiers. Rectifier ratings must be a minimum of 50 percent above calculated operating levels to allow for unanticipated changes in structure or ground bed resistances, or the presence of or changes to interference bonds.

All new, replaced, or relocated pressurized utility piping associated with DTX construction must be protected from corrosion in conformance with the requirements of each utility. At a minimum, test wires must be installed for future testing.

Cathodic protection of all new buried metallic pressure piping and storage tanks is required, including the

- application of a protective coating to the external surfaces of the piping, tank, or both.
- electrical insulation from interconnecting piping and other structures, and segregation into discrete electrically insulated sections depending upon the total length of the piping.
- electrical continuity through installation of insulated copper wires across all mechanical joints other than intended insulators.
- permanent test/access facilities for verifying continuity and effectiveness of isolation and coating, and evaluating protection levels, installed at all insulated connections and at intervals not greater than 100 meters.
- installation of sacrificial anodes or impressed current anodes and rectifier units.

Cathodic protection designs must consider the following:

- Soil environment
- Mutual protection or interference configurations
- Limitations of protection potentials
- Test monitoring

Cathodic protection designs must be based on theoretical calculations using site environmental soil data. Designs must include the following minimal factors:

- Minimum assumed bare surface area of 1 percent
- Calculated anode bed resistance
- Anode size, spacing, and quantity
- Calculated anode life
- Rectifier direct current output ratings, where required

The calculated anode life must not be less than structure design life objectives where periodic anode replacement is not feasible.

20.5.6 Test Facilities

The requirements for test facilities for soil and water corrosion control must be included as part of the design.

20.5.7 Casings

Casings, if required, must be installed bare, unless coating and a sacrificial anode system is required by the owner or manufacturer. Casing insulators must be installed on the carrier pipe to avoid electrical contact between the casing and carrier pipe. End seals will be used to prevent infiltration of soil and groundwater in the annular space between the pipe and casing. Test leads are required on the casing and the carrier pipe.

20.6 Atmospheric Corrosion Control

The corrosivity of the atmosphere will be assessed based on the location of the structure and the conditions of atmospheric exposure. The requirements for materials and protective coatings will be coordinated with the structural and architectural design disciplines. These criteria are provided to ensure the function, preservation, and appearance of structures exposed to the atmosphere. Criteria include the following:

Materials Selection. Acceptable materials must have proven performance records for the service application.

Protective Coatings. Barrier or sacrificial coatings must be used on steel in unconditioned spaces with the exception of weathering steel. Barrier coatings or anodization and sealing may be used on aluminum materials where necessary for corrosion prevention or to enhance appearance. Coatings may be applied to concrete surfaces where necessary for corrosion prevention or to enhance appearance.

Design. Recess moisture traps and dissimilar metals must be avoided.

Sealants. Accumulation of moisture in crevices must be prevented by sealants.

Electrical Equipment. All wayside electrical equipment, except train control equipment, must be enclosed in temperature-controlled environments, or must otherwise incorporate design techniques to prevent moisture condensation and corrosion of integral parts.

Structures. Structures that may be affected by atmospheric corrosion must be identified, including the following:

- Exposed metal surfaces in tunnel structures
- Exposed metal at passenger stations
- Catenary installations and related metallic hardware
- Right-of-way and enclosure fences
- Electrical, mechanical, signal, and communications devices and equipment, and signal and traction power facility housings

The following subsections contain design criteria for various metals and coatings.

20.6.1 Steel and Ferrous Alloys

Carbon steel, ductile iron, and cast iron exposed to the atmosphere must be coated with a sacrificial and barrier-type coating applied to all external surfaces. Rail and rail fasteners do not require coatings. High-strength low-alloy steels must be protected in a manner similar to carbon steels, except where weathering steel is used and is exposed to the outside environment. Coating of metallic contacting surfaces, crevice sealing, and surface drainage must be addressed in the designs. The staining of adjacent structures may result from insufficient material used for the coatings and must be considered.

Series 200 and 300 stainless steels are suitable for use in most exposed situations without further protection. Series 400 stainless steels are acceptable but must be evaluated for possible staining resulting from insufficient material used for the coatings. Welded stainless steel surfaces must be cleaned and passivated after fabrication.

20.6.2 Copper Alloys

Copper and its alloys can be used where exposed to the weather without additional protection. Avoid using bimetallic couplings unless intended as part of the design.

20.6.3 Zinc Alloys

Zinc alloys can be used without additional protection. Avoid using bimetallic couplings.

20.6.4 Aluminum Alloys

An anodized and sealed finish or barrier coating application must be used to provide the best weather-resistant surface. Avoid using bimetallic couplings.

20.6.5 Magnesium Alloys

Magnesium alloys must have a barrier coating applied where long-term appearance is critical. Avoid using bimetallic coupling unless intended as part of the design

20.6.6 Coatings

Coatings must be compatible with the metallic surface to be coated. Resistance to chalking and color and gloss retention must be satisfactorily established through a proven past performance record for the design life of the coating.

20.6.7 Organic Coatings

Organic coating systems must consist of a wash primer (if substrate requires), a primer, intermediate coats, and a finish coat. Acceptable organic coatings are:

- Acrylic, where there is no exposure to direct sunlight
- Alkyd enamel
- Aliphatic polyurethanes where there is no exposure to submersion
- Epoxy, as a primer in an atmospheric environment, or a complete coating system where protected from direct sunlight
- Vinyl copolymers

20.6.8 Metallic Coatings

Acceptable metallic coatings (for carbon and alloy steels) are:

- Aluminum
- Aluminum-zinc
- Zinc (hot dip galvanizing)

APPENDIX A: ABBREVIATIONS

A	Ampere
A.T.	automatic tension
AASHTO	American Association of State Highway And Transportation Officials
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AISC	American Institute of Steel Construction
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APTA	American Public Transportation Association
APWA	American Public Works Association
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating Refrigeration And Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing And Materials
AT&T	American Telephone and Telegraph Company
AWG	American wire gauge
AWS	American Welding Society
AWSS	Auxiliary Water Supply System
BART	Bay Area Rapid Transit
Cal/OSHA	California Department of Industrial Relations Division of Occupational Safety and Health
Caltrans	California Department Of Transportation
CATTCH	California Temporary Traffic Control Handbook
CBC	California Building Code
CBDS	California Department of Transportation (Caltrans), Bridge Design Specifications
CCF	(Caltrain's) Central Control Facility
CCR	California Code of Regulations
CCS	California Coordinate System
CCTV	closed-circuit television
CEC	California Electric Code
CEQA	California Environmental Quality Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CHSRA	California High-Speed Rail Authority
CID	card interface devices
City	City and County of San Francisco
CP	control point
CPUC	California Public Utilities Commission
CRI	color-rendering index
CWH	contact wire height
dBA	A-weighted decibel
dc	direct current
DPT	San Francisco Department of Parking and Traffic
DSHA	deterministic seismic hazard assessment or assessments
DTX	Downtown Rail Extension
EMU	electric multiple unit
EPR	ethylene-propylene rubber
°F	degrees Fahrenheit

f'c	compressive strength
FCC	Federal Communications Commission
FCP	fire command post
FEE	Functionality Evaluation Earthquake
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
fpm	feet per minute
fps	feet per second
FRA	Federal Railroad Administration
ft	foot or feet
ft/sec2	feet/sec/sec
ft2	square foot or square feet
FTA	Federal Transit Administration
f'y	minimum yield strength
GBR	Geotechnical Baseline Report
GDR	Geotechnical Data Report
GFCI	ground-fault circuit interrupter
GIR	Geotechnical Interpretive Report
GO	(CPUC) General Order
gpm	gallons per minute
HASP	health and safety plan
HV	high-voltage
HVAC	heating, ventilation and air-conditioning
Hz	hertz
IATA	International Air Transport Association
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronic Engineers
IESNA	Illuminating Engineering Society of North America
IMC	intermediate metallic conduit
in.	inch or inches
in.2/ft	square inches per foot
in/h	inches per hour
ISRM	International Society of Rock Mechanics
kips	kilopounds
ksi	kips per square inch
kV	kilovolt
LAN	local area network
lbf	pound-force
LCP	local control panel
LED	light emitting diode
lg	gross moment of inertia
LOS	level of service
LRFD	Load and Resistance Factor Design
LRV	light rail vehicle
mA	milliampere
MAS	maximum authorized speed
mph	miles per hour
mph/s	miles per hour per second
Muni	San Francisco Municipal Railway
Mw	maximum moment magnitude
NACE	National Association of Corrosion Engineers
NAD 83	North American Datum of 1983

NAVD 88	North American Vertical Datum of 1988
NEC	National Electrical Code
NEMA	National Electrical Manufactures Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NGS	National Geodetic Survey
NGVD 29	National Geodetic Vertical Datum of 1929
O&M	operations and maintenance
OCC	Operations and Control Center
OCS	overhead contact system
OSHA	Occupational Safety and Health Administration
PCEP	Peninsula Corridor Electrification Program
pcf	pounds per cubic foot
PCJPB	Peninsula Corridor Joint Powers Board
PG&E	Pacific Gas and Electric Company
PLC	programmable logic controllers
ppm	parts per million
PS	paralleling station
psf	pounds per square foot
PSHA	probabilistic seismic hazard assessment or assessments
psi	pounds per square inch
PTC	positive train control
PVC	polyvinyl chloride
RAMS	reliable, available, maintainable and safe
RGS	rigid galvanized steel
RWQCB	Regional Water Quality Control Board
SCADA	supervisory control and data acquisition
SEE	Safety Evaluation Earthquake
SEIS/EIR	Supplemental Environmental Impact Statement/Environmental Impact Report
SEM	sequential excavation method
SFCTA	San Francisco County Transportation Authority
SFFD	San Francisco Fire Department
SFMTA	San Francisco Municipal Transportation Agency
SFPUC	San Francisco Public Utilities Commission
SMACNA	Sheet-Metal and Air Conditioning Contractors National Association
SSMP	safety and security management plan
TJPA	Transbay Joint Powers Authority
TMP	traffic management plan
TOD	transit-oriented development
TRB	Transportation Research Board
TVM	ticket vending machine
UL	Underwriters Laboratories, Inc.
UPS	uninterruptible power supply
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
V	volt
V/H	vertical to horizontal
VAC	volts alternating current
VCP	ventilation control panel
VMS	variable message sign or signs

APPENDIX B: CODES, STANDARDS, GUIDELINES & REFERENCES

Resource Type
FED = Federal
IN = Industry
LOC = Local (City or Region)
OP = Operator
STA = State

Association	Code, Standard, Guideline	Abbr.	In-Text Ref.	Type	Ch. #	Section #	SOURCE LINK
American Association of State Highway and Transportation officials	A Policy on Geometric Design of Highways and Streets (Green Book)	AASHTO	AASHTO Green Book	IN	05	5.1, 5.2.1	https://sjnavarro.files.wordpress.com/2008/08/manual-de-asstho-snh.pdf
American Association of State Highway and Transportation officials	Load and Resistance Factor Design Road Tunnel Design and Construction Guide Specifications	AASHTO	AASHTO LRFD Road Tunnel	IN	10, 12, 13	10.3, 10.4, 10.9, 12.2, 12.3, 13.2, 13.8.2	
American Concrete Institute	ACI 201.2R, Guide to Durable Concrete	ACI	ACI 201.2R	IN	12	12.2.2, 12.6.4	https://www.concrete.org/Portals/0/Files/PDF/Previews/201.2R-16_preview.pdf
American Concrete Institute	ACI 224R, Control of Cracking in Concrete Structures	ACI	ACI 224R	IN	12, 13	N/A	https://www.concrete.org/Portals/0/Files/PDF/224R_01Ch3.pdf
American Concrete Institute	ACI 301, Specifications for Structural Concrete	ACI	ACI 301	IN	12, 13	13.1.1	https://agussugiantocom.files.wordpress.com/2016/07/aci-301-99.pdf
American Concrete Institute	ACI 315R, Guide to Presenting Reinforcing Steel Design Details	ACI	ACI 315R	IN	12	12.2.2, 12.6.4	https://www.concrete.org/Portals/0/Files/PDF/Previews/315R-18_preview.pdf
American Concrete Institute	ACI 318, Building Code Requirements for Structural Concrete and Commentary	ACI	ACI 318	IN	12, 13	12.2.1, 12.3.5, 12.6.4	https://www.usb.ac.ir/FileStaff/5526_2020-1-25-11-12-7.pdf
American Concrete Institute	ACI 365.1, Service-Life Prediction- State-of-the-Art Report	ACI	ACI 365.1	IN	12, 13	13.8.1	https://www.scribd.com/document/251710197/ACI-365-1R-00
American Concrete Institute	ACI 506.2, Specification for Shotcrete	ACI	ACI 506.2	IN	12, 13	13.1.2	https://cecollection2.files.wordpress.com/2020/05/506.2-13-specification-for-shotcrete.pdf

Association	Code, Standard, Guideline	Abbr.	In-Text Ref.	Type	Ch. #	Section #	SOURCE LINK
American Concrete Institute	ACI 506.5R, Guide for Specifying Underground Shotcrete	ACI	ACI 506.5R	IN	13	13.1.2	https://www.concrete.org/Portals/0/Files/PDF/Previews/506.5R-09web.pdf
American Concrete Institute	ACI 533.5R, Guide for Precast Concrete Tunnel Segments	ACI	ACI 533.5R	IN	13	13.6.3	https://www.scribd.com/document/560267982/533-5R-20-preview-Guide-for-Precast-Concrete-Tunnel-Segments
American Concrete Institute	ACI 544.7R, Report on Design and Construction of Fiber-Reinforced Precast Concrete Tunnel Segments	ACI	ACI 544.7R	IN	13	13.6.1	https://www.concrete.org/Portals/0/Files/PDF/Previews/544_7R-16_PREVIEW.pdf
Americans With Disabilities Act Accessibility	ADA Standards for Accessible Design	ADA	ADA	FED	05, 14, 16, 19	5.2, 5.6.1, 14.6.4, 16.3.3	https://www.ada.gov/regs2010/2010ADAStandards/2010ADAStandards.pdf
American National Standards Institute	ANSI Standards	ANSI	ANSI	FED	16, 17, 18 ,19	N/A	https://ansi.org/
American Institute of Steel Construction	AISC 360, Specification for Structural Steel Buildings	AISC	AISC 360	IN	12	N/A	https://www.aisc.org/globalassets/aisc/publications/standards/a360-16-spec-and-commentary.pdf
American Iron and Steel Institute	AISI Standard Specifications	AISI	AISI	IN	16	16.2.6	https://www.stal.com.cn/pdffile/316316l317317l.pdf
Air Movement and Control Association	AMCA Standards	AMCA	AMCA Standards	IN	16	N/A	https://www.amca.org/publish/standards/
American Public Transit Association	APTA-RT-EE-RP-001-02, Heavy-Duty Transportation System Escalator Design Guidelines	APTA	APTA Escalator Design Guidelines	IN	14	14.6.3	https://www.apta.com/wp-content/uploads/APTA-RT-EE-RP-001-02_Rev_3.pdf
American Public Transit Association	APTA-RT-EE-RP-002-03, Heavy-Duty Transportation System Elevator Design Guidelines	APTA	APTA Elevator Design Guidelines	IN	14	14.6.4	https://www.apta.com/wp-content/uploads/Standards_Documents/APTA-RT-EE-RP-002-03.pdf
American Public Transportation Association,	APTA Manual for the Development of System Safety Program Plans for Commuter Railroads	APTA		IN	03	N/A	http://www.bv.transports.gouv.qc.ca/mono/0958428.pdf

Association	Code, Standard, Guideline	Abbr.	In-Text Ref.	Type	Ch. #	Section #	SOURCE LINK
American Public Works Association	APWA Standard Plans for Public Works Construction	APWA		IN	05	5.2	https://ladpw.org/ldd/lddservices/sewerImprovementPlan/docs/Standard%20Plans%20for%20Public%20Works%20Construction%202012.pdf
American Railway Engineering and Maintenance-of-Way Association	AREMA Manual for Railway Engineering	AREMA		IN	05, 06, 07, 08, 10, 12, 13, 14, 15, 18	7.2, 7.2.8, 8.2, 8.3, 8.4, 8.5, 10.6, 12.2, 12.3, 12.4, 12.5, 12.7, 12.8, 18.2.8	https://www.arema.org/AREMA_MBRR/AREMAStore/MRE.aspx
American Society of Civil Engineers/ Structural Engineering Institute	ASCE/SEI 7, Minimum Design Loads and Associated Criteria for Buildings and Other Structures	ASCE	ASCE/SEI 7	IN	10, 12, 13	10.1. 10.7, 10.8	https://www.asce.org/publications-and-news/asce-7#:~:text=An%20integral%20part%20of%20building,wind%20loads%20and%20their%20combinations
American Society of Civil Engineers/ Structural Engineering Institute	ASCE/SEI 37, Design Loads on Structures during Construction	ASCE	ASCE/SEI 37	IN	12	12.3.4, 12.3.5	https://sp360.asce.org/PersonifyEbusiness/Merchandise/Product-Details/productId/233079035#:~:text=Design%20Loads%20on%20Structures%20during%20Construction%2C%20ASCE%2FSEI%2037%2D,structures%20that%20are%20under%20construction.
American Society of Heating, Refrigerating and Air-Conditioning Engineers	Standard 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size	ASHRAE	ASHRAE Standard 52.2	IN	16	16.2.6	https://www.ashrae.org/File%20Library/Technical%20Resources/COVID-19/52_2_2017_COVID-19_20200401.pdf
American Society of Heating, Refrigerating and Air-Conditioning Engineers	Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings	ASHRAE	ASHRAE Standard 90.1	IN	16	16.2.7	https://ashrae.iwrapper.com/ASHRAE_PREVIEW_ONLY_STANDARDS/STD_90.1_2019
American Society of Heating, Refrigerating and Air-Conditioning Engineers	Standard 169, Climatic Data for Building Design Standards, Addendum A	ASHRAE	ASHRAE Standard 169	IN	16	16.2.1	https://xp20.ashrae.org/standard169/169_2013_a_20201012.pdf

Association	Code, Standard, Guideline	Abbr.	In-Text Ref.	Type	Ch. #	Section #	SOURCE LINK
American Society of Heating, Refrigerating and Air-Conditioning Engineers	ASHRAE Handbook – Fundamentals	ASHRAE	ASHRAE Handbook - Fundamentals	IN	16	16.2.2, 16.2.6, 16.2.7	https://www.ashrae.org/technical-resources/ashrae-handbook/description-2021-ashrae-handbook-fundamentals
American Society of Mechanical Engineers	ASME Standards	ASME		IN	06, 14, 16		
American Society of Mechanical Engineers	ASME B31.8, Gas Transmission and Distribution Piping Systems	ASME	ASME B31.8	IN	06		https://law.resource.org/pub/us/cfr/ibr/002/asme.b31.8.2003.pdf
American Society of Mechanical Engineers	ASME A17.1, Handbook on Safety Code for Elevators and Escalators	ASME	ASME A17.1	IN	14	14.6.3, 14.6.4	https://www.asme.org/codes-standards/find-codes-standards/a17-1-csa-b44-handbook-safety-code-elevators-escalators
ASTM International	Annual Book of ASTM Standards, Section 4, Construction, Volume 04.08: Soil and Rock (I): D420 – D5876/D5876M	ASTM		IN	09	9.1, 9.1.9	https://www.astm.org/astm-bos-04.08.html
ASTM International	Annual Book of ASTM Standards, Section 4, Construction, Volume 04.09, Soil and Rock (II) D5878 - Latest	ASTM		IN	09	9.1, 9.1.9	https://www.astm.org/astm-bos-04.09.html
ASTM International	ASTM A36, Standard Specification for Carbon Structural Steel	ASTM	ASTM A36	IN	12, 13	13.1.4	https://www.astm.org/a0036_a0036m-19.html
ASTM International	ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless	ASTM	ASTM A53	IN	12, 13	12.1.3, 13.1.3	https://zims-en.kiwix.campusafrica.gos.orange.com/wikipedia_en_all_nopic/A/ASTM_A53_steel
ASTM International	ASTM A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength	ASTM	ASTM A307	IN	12	12.1.4	https://www.astm.org/a0307-21.html
ASTM International	ASTM A416, Standard Specification for Low-Relaxation, Seven-Wire, Steel Strand for Prestressed Concrete	ASTM	ASTM A416	IN	12	12.1.2	https://www.astm.org/a0416_a0416m-18.html

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ASTM International	ASTM A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel	ASTM	ASTM A572	IN	13	13.1.4	https://www.astm.org/a0572_a0572m-21e01.html
ASTM International	ASTM A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement	ASTM	ASTM A615	IN	12, 13	12.1.2, 13.1.3, 13.1.4	https://www.astm.org/a0615_a0615m-22.html
ASTM International	ASTM A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process	ASTM	ASTM A653	IN	16	16.2.6	https://www.astm.org/a0653_a0653m-20.html
ASTM International	ASTM A706, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement	ASTM	ASTM A706	IN	10, 12, 13	10.3.4, 12.1.2, 13.1.3	https://www.astm.org/a0706_a0706m-22.html
ASTM International	ASTM A709, Standard Specification for Structural Steel for Bridges	ASTM	ASTM A709	IN	12, 13	12.1.3, 13.1.4	https://www.astm.org/a0709_a0709m-21.html
ASTM International	ASTM A722, Standard Specification for High-Strength Steel Bars for Prestressed Concrete	ASTM	ASTM A722	IN	12	12.1.2	https://www.astm.org/a0722_a0722m-18.html
ASTM International	ASTM A820, Standard Specification for Steel Fibers for Fiber-Reinforced Concrete	ASTM	ASTM A820	IN	12,13	12.1.2, 13.1.3	https://www.astm.org/a0820_a0820m-22.html
ASTM International	ASTM A1064, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete	ASTM	ASTM A1064	IN	12, 13	13.1.3	https://www.astm.org/a1064_a1064m-18a.html
ASTM International	ASTM A1085, Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)	ASTM	ASTM A1085	IN	12	12.1.3	https://www.astm.org/a1085_a1085m-15.html
ASTM International	ASTM B3, Standard Specification for Soft or Annealed Copper Wire	ASTM	ASTM B3	IN	17	17.4.11	https://www.astm.org/b0003-13r18.html
ASTM International	ASTM C150, Standard Specification for Portland Cement	ASTM	ASTM C150	IN	20	20.5	https://www.astm.org/c0150_c0150m-22.html

Association	Code, Standard, Guideline	Abbr.	In-Text Ref.	Type	Ch. #	Section #	SOURCE LINK
ASTM International	ASTM C920, Standard Specification for Elastomeric Joint Sealants	ASTM	ASTM C920	IN	13	13.1.6	https://www.astm.org/c0920-18.html
ASTM International	ASTM C1116, Standard Specification for Fiber-Reinforced Concrete	ASTM	ASTM C1116	IN	13	13.1.3	https://www.astm.org/c1116_c1116m-10ar15.html
ASTM International	ASTM C1550, Standard Test Method for Flexural Toughness of Fiber Reinforced Concrete (Using Centrally Loaded Round Panel)	ASTM	ASTM C1550	IN	13	13.1.2	https://www.astm.org/c1550-20.html
ASTM International	ASTM C1609, Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading)	ASTM	ASTM C1609	IN	13	13.1.2	https://www.astm.org/c1609_c1609m-19a.html
ASTM International	ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension	ASTM	ASTM D412	IN	13	13.1.6	https://www.astm.org/d0412-16r21.html
ASTM International	ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)	ASTM	ASTM D2487	IN	09	9.1.3	https://www.astm.org/d2487-17e01.html
ASTM International	ASTM D4623, Standard Test Method for Determination of In Situ Stress in Rock Mass by Overcoring Method—Three Component Borehole Deformation Gauge	ASTM	ASTM D4623	IN	09	9.1.2	https://www.astm.org/d4623-16.html
ASTM International	ASTM D4729, Standard Test Method for In Situ Stress and Modulus of Deformation Using the Flat Jack Method	ASTM	ASTM D4729	IN	09	9.1.2	https://www.astm.org/d4729-19.html
ASTM International	ASTM D7205, Standard Test Method for Tensile Properties of Fiber Reinforced Polymer Matrix Composite Bars	ASTM	ASTM D7205	IN	13	13.1.3	https://www.astm.org/d7205_d7205m-06.html
ASTM International	ASTM F1554, Standard Specification for Anchor Bolts, Steel, 36, 55,	ASTM	ASTM F1554	IN	12	12.1.4	https://www.astm.org/f1554-20.html

Association	Code, Standard, Guideline	Abbr.	In-Text Ref.	Type	Ch. #	Section #	SOURCE LINK
	and 105-ksi Yield Strength						
ASTM International	ASTM F3125, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength	ASTM	ASTM F3125	IN	12	12.1.4	https://www.astm.org/f3125_f3125m-22.html
American Welding Society	AWS Standards	AWS		IN	12	12.1.4	
California Occupational Safety and Health Administration	California Health and Safety Code requirements/regulations	Cal/OSHA		STA	03, 13		
California Department of Transportation	Caltrans Seismic Design Criteria	Caltrans	Caltrans SDC	STA	10, 12	10.3, 10.6,	https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/seismicdesigncriteria-sdc/sdc20april2019final.pdf
California Department of Transportation	Caltrans Bridge Design Specifications	Caltrans	CBDS	STA	12, 13	12.5	https://www.scribd.com/document/272053592/Bridge-Design-Specification-CALTRANS
California Department of Transportation	Caltrans Surveys Manual	Caltrans		STA	05		https://dot.ca.gov/programs/right-of-way/surveys-manual-and-interim-guidelines
California Department of Transportation	Caltrans Highway Design Manual	Caltrans	Caltrans HDM	STA	05, 09	5.2.1, 5.5.2	https://dot.ca.gov/-/media/dot-media/programs/design/documents/hdm-complete-12312020a11y.pdf
California Department of Transportation	Caltrans Trenching and Shoring Manual	Caltrans		STA	09, 10, 12,	12.3	https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/structureconstruction/201906-sc-trenchingshoring-a11y.pdf
California Department of Transportation	Memo to Designers (MTD) 20-1, Seismic Design Methodology	Caltrans	MTD 20-1	STA	10		https://dot.ca.gov/-/media/dot-media/programs/engineering/docume

Association	Code, Standard, Guideline	Abbr.	In-Text Ref.	Type	Ch. #	Section #	SOURCE LINK
							nts/memotodesigner/f0002648-20-1.pdf
California Department of Transportation	Memo to Designers (MTD) 20-16, Seismic Safety Peer Review	Caltrans	MTD 20-16	STA	10	10.10	https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/memotodesigner/f0002756-20-16.pdf
California Department of Transportation	Caltrans Soil and Rock Logging, Classification, and Presentation Manual	Caltrans		STA	09	9.1.1	https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/geotechnical-services/201001-loggingmanual-a11y.pdf
State of California, Department of Transportation	Caltrans Standard Plans, Standard Specifications, and Contract Item Codes	Caltrans		STA	05	N/A	https://dot.ca.gov/programs/design/october-2022-ccs-standard-plans-and-standard-specifications
California Code of Regulations	California Building Code, Title 24, Part 2	CBC		STA	01, 04, 05, 10, 12, 14, 15, 16, 17, 19,	1.7, 4.2, 5.4, 12.2.1, 14.6.1, 15.7.2	https://codes.iccsafe.org/content/CABC2022P1
California Code of Regulations	California Energy Code, Title 24, Part 6	CEC		STA	16	16.2.7.3	https://www.energy.ca.gov/publications/2022/2022-building-energy-efficiency-standards-residential-and-nonresidential
California Code of Regulations	Title 22, Social Security; Section 66261.24, Characteristic of Toxicity	CCR	22 CCR § 66261.24	STA	17	17.5.3	https://govt.westlaw.com/calregs/Document/I8430AAA95B6111EC9451000D3A7C4BC3?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

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California Code of Regulations	Title 22, Social Security; Section 66260.200, Classification of a Waste as Hazardous or Nonhazardous	CCR	22 CCR § 66260.200	STA	17	17.5.3	https://govt.westlaw.com/calregs/Document/I833163155B6111EC9451000D3A7C4BC3?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)
California Code of Regulations	Title 24, Part 1, Article 1, "Energy Building Regulations" Title 24, State Building Code (2022)	CCR		STA	14, 17	14.4.2, 14.4.5, 17.5	
California Environmental Quality Act	California Environmental Quality Act Statues and Guidelines	CEQA	CEQA	STA	04		https://www.califaep.org/docs/CEQA_Handbook_2021.pdf
Code of Federal Regulations	Title 36 – Parks, Forests, and Public Property; Part 1192 – Americans with Disabilities Act (ADA) Accessibility Guidelines for Transportation Vehicles	CFR	36 CFR Part 1192	FED	14	14.1.3.3	https://www.ecfr.gov/current/title-36/chapter-XI/part-1192
Code of Federal Regulations	Title 47 - Telecommunication	CFR	47 CFR	FED	17, 19	17.5.3	https://www.ecfr.gov/current/title-47
Code of Federal Regulations	Title 49 – Transportation; Part 37 – Transportation Services for Individuals with Disabilities (ADA)	CFR	49 CFR Part 37	FED	14	14.1.3.3	https://www.ecfr.gov/current/title-49/subtitle-A/part-37
Code of Federal Regulations	Title 49 – Transportation; Part 38 – Americans with Disabilities Act (ADA) Accessibility Specifications for Transportation Vehicles	CFR	49 CFR Part 38	FED	14	14.1.3.3	https://www.ecfr.gov/current/title-49/subtitle-A/part-38
Code of Federal Regulations	Title 49 – Transportation; Part 192 - Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards	CFR	49 CFR Part 192	FED	06	6.6	https://www.ecfr.gov/current/title-49/subtitle-B/chapter-I/subchapter-D/part-192?toc=1
Code of Federal Regulations	Title 49 – Transportation; Part 213 – Track Safety Standards	CFR	49 CFR Part 213	FED	07, 08	7.2	https://www.ecfr.gov/current/title-49/subtitle-B/chapter-II/part-213

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California High-Speed Rail Authority	CHSRA Design Criteria Manual	CHSRA	CHSRA DCM	OP	07, 08, 12, 14, 16, 18	16.4.1	https://www.ecfr.gov/current/title-49/subtitle-B/chapter-I/subchapter-D/part-192?toc=1
California High-Speed Rail Authority	Environmental and Engineering Technical Memoranda (Design Criteria)	CHSRA		OP	01, 14		
California Public Utilities Commission	General Order 26-D, Regulations Governing Clearances on Railroads and Street Railroads with Reference to Side and Overhead Structures, Parallel Tracks, Crossings of Public Roads, Highways and Streets	CPUC	CPUC GO 26-D	STA	07, 08, 18	7.3.6, 18.2.5	https://docs.cpuc.ca.gov/PUBLISHED/GENERAL_ORDER/59571.htm
California Public Utilities Commission	General Order 36-E, In the Matter of the Establishment or Abolition of Agencies, Non-Agencies, Sidings, Spur Tracks and Other Station Facilities, and the Curtailment of Agency Service of Common Carriers	CPUC	CPUC GO 36-E	STA	05	5.2.1.1, 8.7	https://docs.cpuc.ca.gov/PUBLISHED/Graphics/626.PDF
California Public Utilities Commission	General Order 72-B, Rules Governing the Construction and Maintenance of Crossings at Grade of Railroads with Public Streets, Roads and Highways in the State of California	CPUC	CPUC GO 72-B	STA	05, 08	5.2.1.1, 8.7	https://docs.cpuc.ca.gov/PUBLISHED/GENERAL_ORDER/59565.htm
California Public Utilities Commission	General Order 75-D, Regulations Governing Standards for Warning Devices for At-Grade Highway-Rail Crossings in the State of California	CPUC	CPUC GO 75-D	STA	05, 08	5.2.1.1, 8.7	https://docs.cpuc.ca.gov/PUBLISHED/GENERAL_ORDER/60157.htm
California Public Utilities Commission	General Order 88-B, Rules for Altering Public Highway-Rail Crossings	CPUC	CPUC GO 88-B	STA	05, 08	5.2.1.1, 8.7	https://docs.cpuc.ca.gov/PUBLISHED/GENERAL_ORDER/33542.htm
California Public Utilities Commission	General Order 95, Rules for Overhead Electric Line Construction	CPUC	CPUC GO 95	STA	06, 18	N/A	https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M338/K730/338730245.pdf

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California Public Utilities Commission	General Order 118-A, Regulations Governing the Construction, Reconstruction, and Maintenance of Walkways Adjacent to Railroad Trackage and the Control of Vegetation Adjacent Thereto	CPUC	CPUC GO 118-A	STA	07, 08, 18	7.3	https://docs.cpuc.ca.gov/word_pdf/general_order/go118.pdf
California Public Utilities Commission	General Order 128, Rules for Construction of Underground Electric Supply and Communication Systems	CPUC	CPUC GO 128	STA	(18-not in text)	N/A	https://docs.cpuc.ca.gov/PUBLISHED/GENERAL_ORDER/52591.htm
California Public Utilities Commission	General Order 135, Regulations Governing the Occupancy of Public Grade Crossings by Railroads	CPUC	CPUC GO 135	STA	05, 08	5.2.1.1, 8.7	https://docs.cpuc.ca.gov/PUBLISHED/GENERAL_ORDER/59573.htm
California Public Utilities Commission	General Order 164-E, Rules and Regulations Governing State Safety Oversight of Rail Fixed Guideway Systems	CPUC	CPUC GO 164-E	STA	05, 07, 08	N/A	https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M213/K913/213913509.pdf
California Public Utilities Commission	General Order 176, Rules for Overhead 25 kV AC Railroad Electrification Systems for a High-Speed Rail System	CPUC	CPUC GO 176	STA	07, 08, 18	18.2, 18.2.8.2	https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M151/K399/151399809.pdf
City and County of San Francisco	San Francisco Municipal Code; San Francisco Health Code; Article 22A, Analyzing Soils for Hazardous Waste	City		LOC	04	4.8	https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_health/0-0-0-4093
City and County of San Francisco	San Francisco Municipal Code; San Francisco Plumbing code	City		LOC	16	16.3.1	https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_building/0-0-0-85773
California Department of Water Resources	State of California Well Standards, Monitoring Well Standards (Bulletin 74-90) (1981)	DWR		STA	09		https://archive.org/details/protectwellst7490calirich
Federal Transit Administration	Transit Security Design Considerations Final Report	FTA		FED	03		https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/ftasesc.pdf
Federal Transit Administration	Hazard Analysis Guidelines for Transit Projects (2000)	FTA		FED	03		https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/HAGuidelines.pdf

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Federal Transit Administration	FTA Report No. 0123, Transit Noise and Vibration Impact Assessment Manual	FTA		IN	14	14.4.3	https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf
Institute of Electrical and Electronic Engineers	IEEE 446, Standard for Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications	IEEE	IEEE 446	IN	17	17.2.2	https://standards.ieee.org/ieee/446/669/
Institute of Electrical and Electronic Engineers	IEEE 1202, Standard for Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies	IEEE	IEEE 1202	IN	17	17.4.11	https://law.resource.org/pub/us/cfr/ibr/004/ieee.1202.1991.pdf
Institute of Electrical and Electronic Engineers	IEEE 1584, Guide for Performing Arc-Flash Hazard Calculations	IEEE	IEEE 1584	IN	17	17.8	https://standards.ieee.org/ieee/1584/5802/
Illuminating Engineering Society	Lighting standards	IES		IN	17		https://www.ies.org/standards/lighting-library/
Illuminating Engineering Society	Recommended Practice Manual, Lighting for Exterior Environments (RP-33)	IES	IES RP-33	IN	17	17.5.1	https://standards.globalspec.com/std/9887592/IES%20RP-33
International Society For Rock Mechanics and Rock Engineering	ISRM Publications	ISRM		IN	09		https://isrm.net/newsletter/show/145
Metropolitan Transportation Commission	Regional Transit Wayfinding Guidelines and Standards	MTC		LOC	14	14.1.3, 14.3.2, 14.4.5	https://mtc.ca.gov/sites/default/files/MTC_Regional_Hub_Signage_Standards_2012.pdf
National Association of Corrosion Engineers	NACE RP0177, Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems	NACE	NACE RP0177	IN	17	17.1.10	http://bazdarco.com/wp-content/uploads/2019/10/NACE-SP0177-2014-1.pdf

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National Association of Corrosion Engineers	NACE Standards	NACE		IN	17, 20		https://assets.website-files.com/5b2a8a4419452706be4aa19a/5c14217fa808384a4b0ceab9_NACE Standards_Detailed.pdf
National Cooperative Highway Research Program	NCHRP Report 611, Seismic Analysis and Design of Retaining Walls, Buried Structures, Slopes, and Embankments	NCHRP	NCHRP Report 611	IN	10	10.4.2, 10.9.3	http://www.ce.memphis.edu/7137/PDFs/Seismic%20Manual/nchrp_rpt_611.pdf
National Electrical Manufacturers Association	NEMA Standards	NEMA		IN	14, 17		https://www.nema.org/standards
National Electric Safety Code	National Electric Safety Code	NESC		IN	17		https://ethw.org/National_Electrical_Safety_Code_ANSI_C2
National Environmental Policy Act	National Environmental Policy Act	NEPA		FED	04		https://ceq.doe.gov/#:~:text=NEPA%20was%20the%20first%20major,actions%20prior%20to%20making%20decisions.
National Fire Protection Association	NFPA 10, Standard for Portable Fire Extinguishers	NFPA		IN	15	17.1.10, 17.2.2, 17.5.2	
National Fire Protection Association	NFPA 14, Standard for the Installation of Standpipe and Hose Systems	NFPA	NFPA 14	IN	15	15.4.5	https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=14
National Fire Protection Association	NFPA 54, National Fuel Gas Code	NFPA	NFPA 54	IN	06		https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=54
National Fire Protection Association	NFPA 70, National Electric Code	NFPA	NFPA 70	IN	06, 14, 15, 16, 17, 18, 19	17.1.10, 17.2.3, 17.7, 17.8	https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70

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National Fire Protection Association	NFPA 72, National Fire Alarm and Signaling Code	NFPA	NFPA 72	IN	15	15.3.1, 15.3.2	https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=72
National Fire Protection Association	NFPA 90A, Standard for Installation of Air-Conditioning and Ventilation Systems	NFPA	NFPA 90A	IN	16	16.2.6	https://catalog.nfpa.org/NFPA-90A-Standard-for-the-Installation-of-Air-Conditioning-and-Ventilating-Systems-P1215.aspx
National Fire Protection Association	NFPA 101, Life Safety Code	NFPA	NFPA 101	IN	14, 15, 16, 17, 18, 19	15.7.2, 17.1.10, 17.2.2, 17.5.2	https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=101
National Fire Protection Association	NFPA 101A - Guide on Alternate Approaches to Life Safety	NFPA	NFPA 101A	IN	16		https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=101A
National Fire Protection Association	NFPA 110 – Standard for Emergency and Standby Power Supply Systems	NFPA	NFPA 110	IN	17	17.2.2, 17.2.3	https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=110
National Fire Protection Association	NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems	NFPA	NFPA 130	IN	02, 03, 12, 13, 14, 15, 16, 17, 18, 19	2.5.2, 14.1.1, 14.1.3, 14.6.1, 15.3.2, 15.7, 15.8, 16.1, 17.1.10, 17.2.2, 17.5	https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=130
National Fire Protection Association	NFPA 220, Standard on Types of Building Construction	NFPA	NFPA 220	IN	14	14.2.6	https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=220

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National Fire Protection Association	NFPA 502, Standard for Road Tunnels, Bridges, and Other Limited Access Highways	NFPA	NFPA 502	IN	16	16.4.1	https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=502
National Fire Protection Association	NFPA 750, Standard on Water Mist Fire Protection Systems	NFPA	NFPA 750	IN	15	15.4.4	https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=750
National Fire Protection Association	NFPA 780 – Standard for Lightning Protection Systems	NFPA		IN	18		https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=780
Peninsula Corridor Joint Powers Board	Caltrain Engineering Standards	Caltrain		OPS	01, 05, 06, 07, 08, 09, 10, 12, 14, 17, 18, 19		
Peninsula Corridor Joint Powers Board	Caltrain Design Criteria	Caltrain	Caltrain Design Criteria	OPS	01, 05, 07, 08, 14, 19	5.5.1, 7.1.3, 7.2.2, 7.2.3, 8.1.4, 8.2, 8.6.3, 8.7, 12.6, 14.2.1, 14.3.1, 19.3, 19.5, 19.6, 19.7, 19.8	
Peninsula Corridor Joint Powers Board	Caltrain Peninsula Corridor Electrification Project (PCEP) Design Criteria	Caltrain	Caltrain PCEP Design Criteria	OPS	18, 19, 20	18.2, 18.3, 19.1, 19.2, 19.4, 19.6, 19.7, 19.8, 19.9, 19.10, 20.3	
Peninsula Corridor Joint Powers Board	Caltrain Standards for Design and Maintenance of Structures	Caltrain		OPS	10, 12	12.4, 12.5, 12.6, 12.7, 12.8	
Peninsula Corridor Joint Powers Board	Caltrain Standards for Excavation Support Systems	Caltrain		OPS	10, 12	10.9.3, 12.3	
Peninsula Corridor Joint Powers Board	Caltrain Standard Drawings	Caltrain		OPS	01, 08	8.2.4	

Association	Code, Standard, Guideline	Abbr.	In-Text Ref.	Type	Ch. #	Section #	SOURCE LINK
Peninsula Corridor Joint Powers Board	Caltrain Standard Specifications	Caltrain		OPS	01		
San Francisco Municipal Code	San Francisco Building Code	SFBC		LOC	09, 10, 11, 12, 14, 15	10.7, 10.10, 12,2, 12.6, 12.7, 12.8 14.6.1, 15.7.2	https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_building/0-0-0-91586
San Francisco Building Code	San Francisco Building Code. Administrative Bulletin AB-082, Guidelines and Procedures for Structural Design Review	SFBC		LOC	10	10.10	https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_building/0-0-0-95162
San Francisco Department of Public Health	Requirements	SFDPH		LOC	09		
San Francisco Department of Public Health	San Francisco Health Code, Article 22A, Analyzing Soils for Hazardous Waste	SFDPH		LOC	04		https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_health/0-0-0-4093
San Francisco Department of Public Works	Order No. 187005 Regulations for Excavating and Restoring Streets in San Francisco	SFDPW		LOC	05, 06, 09	6.5	https://sfpublicworks.org/sites/default/files/PW-Order-187005-Signed.pdf
San Francisco Department of Public Works	Code for Industrial Wastes Code, Article 4.1	SFDPW		LOC	04	4.7.3, 4.8	https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_publicworks/0-0-0-441
San Francisco Department of Public Works	Standard Plans and Specifications	SFDPW		LOC	05, 06		https://sfpublicworks.org/services/standards-specifications-and-plans
San Francisco Fire Department	Administrative Bulletins	SFFD		LOC	05, 14, 15		https://sf-fire.org/administrative-bulletins
San Francisco Municipal Transportation Agency	Central Subway Design Criteria	SFMTA		LOC	12, 16	12.2.1	
San Francisco Municipal Transportation Agency	SFMTA Rail Rule Book	SFMTA		LOC	05		https://www.sfmta.com/sites/default/files/reports-and-documents/2018/01/sfmta_rail_rule_book.pdf

Association	Code, Standard, Guideline	Abbr.	In-Text Ref.	Type	Ch. #	Section #	SOURCE LINK
San Francisco Municipal Transportation Agency	SFMTA Regulations for Working in San Francisco Streets (Blue Book)	SFMTA	SFMTA Blue Book	LOC	06, 09	6.5, 6.6	https://www.sfmta.com/sites/default/files/reports-and-documents/2022/11/blue_book_8th_ed_rev_10-2022.pdf
San Francisco City/County San Francisco Public Utilities Commission	Design Guidelines & Standards	SFPUC		LOC	06, 09, 16	6.6	https://sfpuc.org/construction-contracts/design-guidelines-standards
San Francisco Public Utilities Commission	Asset Protection Standards	SFPUC		LOC	06	6.5	https://sfpuc.org/sites/default/files/construction-and-contracts/design-guidelines/Asset_Protection_Standards.pdf
San Francisco Public Utilities Commission	San Francisco's Water, Sewer, and Stormwater Requirements Manual	SFPUC	SPUC Requirements Manual	LOC	09	9.5	https://sfpuc.org/sites/default/files/accounts-and-services/Water-Sewer-Stormwater_Reqs_manual.pdf
San Francisco Publics Works	SFPW Standard Specifications and Plans	SFPW	SFPW Standard Specifications and Plans	LOC	05	5.2	https://sfpublicworks.org/services/standards-specifications-and-plans
Sheet Metal and Air Conditioning Contractors National Association	Sheet Metal and Air Conditioning Contractors National Association Standards	SMACNA		IN	16	16.1.6, 16.2.6	https://www.smacna.org/resources/technical/technical-standards
Telecommunications Industries Association	Standards	TIA		IN	19		https://tiaonline.org/products-and-services/buy-standards/
Underwriters Laboratories, Inc.	Standards	UL		IN	16, 17, 19		https://ulstandards.ul.com/
U.S. Army Corps of Engineers	Tunnels and Shafts in Rock. Engineering and Design Manual, EM 1110-2-2901. 30 May 1997.	USACE		FED	13		https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-2901.pdf?ver=vpqfUT10oc-kO-YTkxYHzw%3d%3d

Association	Code, Standard, Guideline	Abbr.	In-Text Ref.	Type	Ch. #	Section #	SOURCE LINK
U.S. Corp. of Engineers	USACE HEC-1, Flood Hydrograph Package User's Manual	USACE		FED	05	5.5.2	https://www.hec.usace.army.mil/publications/ComputerProgramDocumentation/HEC-1_UsersManual_(CPD-1a).pdf
U.S. Corp. of Engineers	Engineering Manual EM 1110-1-1804, Geotechnical Investigations	USACE		FED	09	9.1	https://www.publications.usace.army.mil/portals/76/publications/engineermanuals/em_1110-1-1804.pdf
United States Department of the Interior, Bureau of Reclamation	USBR Earth Manual	USBR		FED	09	9.1, 9.1.8	https://www.usbr.gov/tsc/techreferences/mands/mands-pdfs/earth.pdf
United States Department of the Interior, Bureau of Reclamation	USBR Ground Water Manual	USBR		FED	09	9.1	https://www.usbr.gov/tsc/techreferences/mands/mands-pdfs/GndWater.pdf
United States Department of Defense	United Facilities Criteria, UFC3-220-01N – Geotechnical Engineering Procedures for Foundation Design of Buildings and Structures	USDOD		FED	09		https://www.wbdg.org/FFC/DOD/UFC/ARCHIVES/ufc_3_220_01n_2005.pdf
U.S. Department of Transportation/ Federal Transit Administration	Circular 5800.1, Safety and Security Management Guidance for Major Capital Projects	FTA	FTA Circular 5800.1	FED	03		https://www.transit.dot.gov/regulations-and-guidance/circular-final-fta-c-58001-safety-and-security-management-guidance-major

Reference	Chapter	Section	Source
Better Streets Plan, Final Plan 2010	N/A	N/A	https://sfplanning.org/sites/default/files/archives/BetterStreets/docs/Better-Streets-Plan_Final-Adopted-10-7-2010.pdf
Guide to Cone Penetration Testing for Geotechnical Engineering (Robertson and Cabal 2015).	09	9.1.4	https://www.novotechsoftware.com/downloads/PDF/en/Ref/CPT-Guide-5ed-Nov2012.pdf
Next Generation Attenuation – Western U.S. (NGA-West2)	10	10.1	https://www.iitk.ac.in/nicee/wcee/article/WCEE2012_2572.pdf
PAS 8810, Tunnel Design - Design of Concrete Segmental Tunnel Linings - Code of Practice	13	13.6.3	https://www.en-standard.eu/pas-8810-2016-tunnel-design-design-of-concrete-segmental-tunnel-linings-code-of-practice/
California Temporary Traffic Control Handbook, 7th Edition, 2018	05	5.6	https://www.sce.com/sites/default/files/inline-files/tcm.pdf
American Society of Civil Engineers (ASCE), R. Essex, Editor (2007). "Geotechnical Baseline Reports for Construction, Suggested Guidelines." Technical Committee on Geotechnical Reports of the Underground Technology Research Council.	09	9.2	https://sp360.asce.org/PersonifyEbusiness/Merchandise/Product-Details/productId/232148866
Bowles, J.E. (2001). "Foundation Analysis and Design," 5th Edition. McGraw-Hill, New York.	09	9.4.1	https://trid.trb.org/view/311245
Clough, G. W. and O'Rourke, T. D. (1990), "Construction induced movements of in situ walls." Proceedings on Conf. on Design and Performance of Earth Retaining Structures. ASCE, Geotechnical Special Publication No. 25: 439-470.	09	9.4.1	https://www.researchgate.net/profile/Wayne-Clough/publication/279565072_Construction_induced_movements_of_in_situ_wall/links/5924b776a6fdcc4443127b81/Construction-induced-movements-of-in-situ-wall.pdf
Deere, D.U. and Deere, D.W. (1989), "Rock Quality Designation after Twenty Years." U.S. Army Corps of Engineers. Report No. GL-89-1.	09	N/A	https://apps.dtic.mil/sti/citations/ADA207597#:~:text=Twenty%20years%20of%20experience%20is%20now%20available%20in,length%20of%20NX%20size%20or%20larger%20core%20diameters.
Medley, E. W. (1994). "The Engineering Characterization of Melanges and Similar Block-in-Matrix Rocks (Bimrocks)." University of California, Berkeley, Ph.D. Dissertation.	09	N/A	https://www.researchgate.net/publication/35292215_The_engineering_characterization_of_melanges_and_similar_block-in-_matrix_rocks_Bimrocks
NTNU-Anleggsdrift (SINTEF) (1998). Project Report 1F-98 "Hard Rock Tunnel Boring. The Boring Process.	09	9.1.9	
Robertson and Cabal (2015) "Guide to Cone Penetration Testing for Geotechnical Engineering," 6th Edition, 2015.	09	9.4.1	https://pdfslide.net/documents/guide-to-cone-penetration-testing-guide-to-cone-penetration-testing-for-geotechnical.html?page=9

Reference	Chapter	Section	Source
Stokes and Varnes (1955). "Glossary of Selected Geologic Terms." Proc. Colorado Scientific Society, Vol. 16.	09	N/A	https://books.google.com/books/about/Glossary_of_Selected_Geologic_Terms_with.html?id=1q8_AAAAIAAJ
Bozorgnia, Y. and K.W. Campbell. 2016. "NGA-West2 ground motion model for the vertical-to-horizontal ratio of PGA, PGV, and linear response spectra." Earthquake Spectra Vol. 32: 951–978.	10	N/A	https://journals.sagepub.com/doi/10.1193/100614EQS151M
Donahue, J. L., J. P. Stewart, N. Gregor, and Y. Bozorgnia. May 2019. Ground-Motion Directivity Modeling for Seismic Hazard Applications. Review Panel: J. D. Bray, S. A. Mahin, I. M. Idriss, R. W. Graves, T. Shantz. Pacific Earthquake Engineering Research (PEER) Center Report No. 2019/03.	10	N/A	https://peer.berkeley.edu/publications/2019-03
Gülerce, Z. and Abrahamson, N.A. 2011. "Site-specific design spectra for vertical ground motion." Earthquake Spectra Vol. 27 No. 4: 1023-1047.	10	N/A	https://journals.sagepub.com/doi/10.1193/1.3651317
Hashash, Y. M. A., J. J. Hook, B. Schmidt, and J.I.-C Yao. 2001. "Seismic design and analysis of underground structures." Tunneling and Underground Space Technology 16: 247-293.	10	N/A	https://trid.trb.org/view.aspx?id=709991#:~:text=SEISMIC%20DESIGN%20AND%20ANALYSIS%20OF%20UNDERGROUND%20STRUCTURES.%20Underground,have%20experienced%20significant%20damage%20in%20recent%20large%20earthquakes.
Hashash, Y. M. A., D. Park, and J. I.-C Yao. 2005. "Ovaling deformations of circular tunnels under seismic loading, an update on seismic design and analysis of underground structures." Tunneling and Underground Space Technology, 20 (2005): 435-441.	10	N/A	https://www.sciencedirect.com/science/article/abs/pii/S0886779805000167
Hashash, Y. M. A., K. Karina, D. Koutsoftas, and N. O'Riordan. 2010. "Seismic design considerations for underground box structures." In Proceedings of the 2010 Earth Retention Conference. Geotechnical Special Publication Vol. 384, No. 208 GSP.	10	N/A	https://experts.illinois.edu/en/publications/seismic-design-considerations-for-underground-box-structures
Hayden, C. P., J. D. Bray, and N. A. Abrahamson. 2014. "Selection of near-fault pulse motions." Journal of Geotechnical and Geoenvironmental Engineering Vol. 140, Issue 7.	10	N/A	https://www.semanticscholar.org/paper/Selection-of-Near-Fault-Pulse-Motions-Hayden-Bray/e659320f09ee14afd2a037c2bcfd37280f545b64#:~:text=Selection%20of%20Near-Fault%20Pulse%20Motions%20C.%20Hayden%2C%20J.,series%20that%20can%20be%20very%20damaging%20to%20structures.

Reference	Chapter	Section	Source
Mononobe, N. and H. Matsuo, October 22-28, 1929. "On the determination of earth pressures during earthquakes." In Proceedings of the World Engineering Congress, Tokyo, Japan.	10	N/A	https://www.scribd.com/document/363172510/1929-MONONOBE-on-the-Determination-of-Earth-Pressure-During-Eartquakes?irclickid=WnwyOmy3axyNWz-3FVWSXQYFUkA04ASb3xP6zs0&irpid=2003851&utm_source=impact&utm_medium=cpc&utm_campaign=affiliate_pdm_acquisition_Bing%20Rebates%20by%20Microsoft&sharedid=EdgeBingFlow&irgwc=1
National Cooperative Highway Research Program (NCHRP) 2008. Seismic Analysis and Design of Retaining Walls, Buried Structures, Slopes, and Embankments. Report 611.	10	N/A	https://trid.trb.org/view/878281#:~:text=Seismic%20Analysis%20and%20Design%20of%20Retaining%20Walls%2C%20Buried,report%20details%20the%20development%20of%20the%20design%20procedures.
Newmark, N. 1965. "Effects of earthquakes on dams and embankments." Geotechnique Vol 15, No 2: 139-160.	10	N/A	https://www.icevirtuallibrary.com/doi/10.1680/geot.1965.15.2.139
Okabe, S. 1926. "General theory of earth pressure." Journal of the Japanese Society of Civil Engineers, Tokyo, Japan: 12.	10	N/A	
Ostadan, F. and J. Penzien. 2001. "Seismic Design of Cut-and-Cover Sections of the Bay Area Rapid Transit Extension to San Francisco Airport." Second U.S.-Japan Workshop on Soil Structure Interaction, Tsukuba, Japan: March 6-8, 2001.	10	N/A	https://www.pwri.go.jp/eng/ujnr/tc/a/wsssi/pdf/b14.pdf
Penzien. 2000. "Seismically induced racking of tunnel linings." Earthquake Engineering and Structural Dynamics 29: 683-691.	10	N/A	https://onlinelibrary.wiley.com/doi/abs/10.1002/%28SICI%291096-9845%28200005%2929%3A5%3C683%3A%3AAID-EQE932%3E3.0.CO%3B2-1
Power, M.S., D. Rosidi, J. Kaneshiro, S.D. Gilstrap, and S-J. Chiou. 1998. "Summary of Evaluation of Procedures for the Seismic Design of Tunnels." Draft Report.	10	N/A	
Seed, H.B. and R.V. Whitman. 1970. "Design of Earth Retaining Structures for Dynamic Loads." Lateral Stresses in the Ground and Design of Earth-Retaining Structures. American Society of Civil Engineers: 103-147.	10	N/A	https://cedb.asce.org/CEDBsearch/record.jsp?dockey=0017611
Shahi, S.K. and J.W. Baker. 2011. "An empirically calibrated framework for including the effects of near-fault directivity in probabilistic seismic hazard analysis." Bulletin of the Seismological Society of America Vol. 101, No. 2: 742-755.	10	N/A	https://pubs.geoscienceworld.org/ssa/bssa/article-abstract/101/2/742/349560/An-Empirically-Calibrated-Framework-for-Including?redirectedFrom=fulltext
Wang, J.-N. 1993. "Seismic Design of Tunnels: A State-of-the-Art Approach." Monograph 7. Parsons Brinckerhoff Quade & Douglas, Inc., New York.	10	N/A	http://cdn.wspgroup.com/8kzmue/seismic-design-of-tunnels-a-simple-state-of-the-art-design-approach.pdf
Whitman, R. V. 1990. "Seismic Design and Behavior of Gravity Retaining Walls," American Society of Civil Engineers Geotechnical Special Publication 25 Design and Performance of Earth Retaining Structures: 817-842.	10	N/A	https://ascelibrary.org/doi/abs/10.1061/AJGEB6.0000783

Reference	Chapter	Section	Source
Geotechnical Technical Guidance Manual (GTGM), 2007 Federal Standards	09	N/A	https://flh.fhwa.dot.gov/resources/design/pddm/Geotechnical_TGM.pdf
NHI-16-072 Geotechnical Site Characterization (Geotechnical Engineering Circular No.5) (2017)	09	N/A	https://www.fhwa.dot.gov/engineering/geotech/pubs/nhi16072.pdf
NHI-97-021, Training Course in Geotechnical and Foundation Engineering: Subsurface Investigation (1997)	09	N/A	https://www.fhwa.dot.gov/engineering/geotech/library_listing.cfm?sort=default
NHI-I-10-034, Technical Manual for Design and Construction of Road Tunnels – Civil Elements, December 2009	09, 12	N/A	https://www.fhwa.dot.gov/bridge/tunnel/pubs/nhi09010/tunnel_manual.pdf
Parsons Transportation Group and Wood. October 22, 2021. Draft Geotechnical Data Report, Downtown Extension Project, Transbay Program – Phase 2.	10	N/A	
Parsons Transportation Group & Wood Environmental & Infrastructure Solutions, Inc. April 22, 2022. Geotechnical Data Report, Downtown Rail Extension Project, Transbay Program (four volumes). Prepared for the Transbay Joint Powers Authority, San Francisco.	09	N/A	
Parsons Transportation Group & Wood Environment & Infrastructure Solutions, Inc. August 26, 2022. Geotechnical Interpretive Report, Part I, Mined Tunnel Segment, Downtown Rail Extension Project. Prepared for the Transbay Joint Powers Authority, San Francisco.	09	N/A	
Parsons Transportation Group & Wood Environment & Infrastructure Solutions, Inc. May 6, 2022. Geotechnical Interpretive Report, Part II, Cut-and-Cover and Retained Cut Segments, Downtown Rail Extension Project, Transbay Program. Prepared for the Transbay Joint Powers Authority, San Francisco.	09	N/A	
Parsons Transportation Group & Wood Environment & Infrastructure Solutions, Inc. May 6, 2022. Geotechnical Interpretive Report, Part III, Seismic Hazard, Downtown Rail Extension Project, Transbay Program (four volumes). Prepared for the Transbay Joint Powers Authority, San Francisco.	09	N/A	
Parsons Transportation Group. April 30, 2010. Final Geotechnical Interpretive Report, Part I, Soil and Rock Characterization for Mined Tunnel Design for the Caltrain Downtown Extension.	10	N/A	
Parsons Transportation Group. May 18, 2010. Final Geotechnical Interpretive Report, Part II, Design Recommendations for the 30% Preliminary Engineering Design Phase of the Cut-and-Cover Segment of the DTX Alignment for the Caltrain Downtown Extension.	09	N/A	

Reference	Chapter	Section	Source
Parsons Transportation Group & Wood Environmental & Infrastructure Solutions, Inc. June 3, 2021. Geotechnical Investigation Plan, Downtown Rail Extension Project, Transbay Program. Prepared for the Transbay Joint Powers Authority, San Francisco.	09	N/A	
Parsons Transportation Group & Wood Environmental & Infrastructure Solutions, Inc. October 22, 2021. Geotechnical Characterization of the Major Soil Strata and Rock Units, Downtown Rail Extension Project, Transbay Program. Prepared for the Transbay Joint Powers Authority, San Francisco.	09	N/A	
Slate Geotechnical Consultants Inc. March 10, 2022. Seismic Hazard Analysis – Phase 2 Transbay Program. Prepared for AECOM, San Francisco.	09	N/A	
U.S. Department of Transportation Federal Transit Administration and the Transbay Joint Powers Authority. November 20, 2018. Transbay Transit Center Program Final Supplemental Environmental Impact Statement/ Environmental Impact Report.	04	N/A	https://tjpa.org/tjpa/documents/environmental-documents
Attewell, P.B., Yeates, J. and Selby, A.R. 1986. "Soil movements induced by Tunnelling." Chapman and Hall, New York.	11	N/A	https://julac-cuh.primo.exlibrisgroup.com/discovery/fulldisplay?vid=852JULAC_CUH:CUH&docid=alma9910119896597034 08&context=L&lang=en
Bjerrum, I. 1963. "Allowable Settlement of Structures." Proceedings of European Conference on Soil Mechanics and Foundation Engineering." Weisbaden, Germany, Vol. 2: 35-137.	11	N/A	
Boscardin, M. and Cording, E. 1989. "Building Response to Excavation Induced Settlements." Journal of Geotechnical Engineering. ASCE. Vol. 115, No 1: 1-21.	11	N/A	https://ascelibrary.org/doi/abs/10.1061/%28ASCE%290733-9410%281989%29115%3A1%281%29
Bracegirdle, A., Mair, R.J., Nyren, R.J. and Taylor, R.N. 1996. "A methodology for evaluating potential damage to cast iron pipes induced by tunneling." Geotechnical Aspects of Underground Construction in Soft Ground, Mair & Taylor (eds.). Balkema, Rotterdam: 659-664.	11	N/A	https://www.tib.eu/en/search/id/BLCP%3ACN020385797/
Burland, J.B. Broms, B.B. and Demello V.F.B. 1977. "Behaviour of Foundations and Structures." Proceedings of the 9th International Conference on Soil Mechanics and Foundation Engineering.	11	N/A	https://inspectapedia.com/structure/Behaviour-of-Foundations-Footings-Burland.pdf
Cording, E.J., Long, J.L., Laefer, D., Ghahreman, B. (2010). "Assessment of Excavation-Induced Building Damage. Proceedings of the Earth Retention Conference 3 (2010), Seattle, WA. ASCE Library.	11	N/A	https://ascelibrary.org/doi/10.1061/41128%28384%297

Reference	Chapter	Section	Source
Mair, R.J., Williamson, M.G., (2014). "The Influence of Tunneling and Deep Excavation on Piled Foundations." Keynote Lecture. Proceedings of the 8th International Conference on Geotechnical Aspects of Underground Construction in Soft Ground., 21-30, 2014.	11	N/A	https://www.issmge.org/publications/publication/the-influence-of-tunnelling-and-deep-excavation-on-piled-foundations
Mair, R.J., Taylor, R.N. and Burland, J.B. 1996. "Prediction of ground movements and assessment of risk of building damage due to bored tunnelling." Geotechnical Aspects of Underground Construction in Soft Ground (eds R.J. Mair and R.N. Taylor), Balkema, Rotterdam: 713-718.	11	N/A	https://www.issmge.org/publications/publication/prediction-of-ground-movements-and-assessment-of-risk-of-building-damage-due-to-bored-tunnelling
Peck, R. (1969). "Deep Excavations and Tunneling in Soft Ground," in Proceedings of the 7th International Conference on Soil Mechanics and Foundation Engineering, Mexico City, 4, 225–290.	11	N/A	https://www.issmge.org/publications/publication/deep-excavations-and-tunneling-in-soft-ground
Son, M., and Cording, E.J. (2005). "Estimation of Building Damage Due to Excavation-Induced Ground Movements." Journal of Geotechnical and Geoenvironmental Engineering. February 2005. pp. 162-177.	11	N/A	https://ascelibrary.org/doi/abs/10.1061/%28ASCE%291090-0241%282005%29131%3A2%28162%29#:~:text=Building%20damage%20due%20to%20excavation%2Dinduced%20ground%20movement%20is%20evaluated,by%20the%20ground%20settlement%20profile.
Transportation Research Board's Transit Capacity and Quality of Service Manual, 2nd Edition.	14	14.1.1	https://www.trb.org/Publications/Blurbs/153590.aspx
Transit Cooperative Research Program Report 86/National Cooperative Highway Research Program Report 525, Volume 12, "Making Transportation Tunnels Safe and Secure," Transportation Research Board	03	N/A	https://transops.s3.amazonaws.com/uploaded_files/nchrp_rpt_525v12.pdf
Wahls, H. E. 1981. "Tolerable Settlement of Buildings." Journal of the Geotechnical Engineering Division. ASCE. Vol. 107, No. GT11: 1489-1504.	11	N/A	https://trid.trb.org/view/173733

APPENDIX C
DTX DESIGN CRITERIA DRAFT BOOK 02 REVIEW COMMENTS

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 51
Comments Closed 51
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 01, Overview*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team/Parsons)	AG	Brad Pollock (Design Team/Parsons)	BP
Chukwuma Umolu (Design Team/Parsons)	CU	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
Peter Chou (Design Team/Parsons)	PC	L. Godbold (Design Team/Parsons)	LDG
David Fung (Design Team/Robin Chiang & Co.)	DF	Henry Chang (Design Team/Structus)	HC
Sangyoon Min (Design Team/Parsons)	SM	James Deane (CHSRA)	JD
Tony Hargitay (CHSRA)	TH	Pete Gutierrez (Caltrain)	PCG
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS		

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Section 1.2	BP	11/30/21	Townsend Station length noted as 875ft. With stair structures now at each end of station the overall length has increased.	05/09/22	KS	A	The project description has been updated, noting that the platform level will have two tracks, an 875-foot center platform for Caltrain passengers, and two 800-foot side platforms for high-speed rail passengers.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	1.2 - Project Description, Systems and Trackwork, ¶1-2	CU	11/29/21	Revise sentence to read: *Trackwork includes the mainline tracks through the tunnel and stations as well as a 1/2-mile of at-grade tracks within the existing Caltrain right-of-way that include the tie-in with Fourth & King station leads, a turnback track and maintenance-of-way storage.*	05/09/22	KS	DE	Our updated project description, which was accepted by the GEC on 5/9 reads: *Trackwork includes the mainline tracks through the tunnel and stations as well as 0.6 miles of at-grade maintenance-of-way and turnback tracks within the existing Caltrain right-of-way.*	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	1.2 - Project Description, Salesforce Transit Center Fit-out, ¶1-3	CU	11/29/21	Include provision for future BART/Muni Pedestrian Connector since it is still part of TJPA's program and design needs to account for it.	05/09/22	KS	DE	The pedestrian connector is called out under 1.5, Interface Coordination, as it is part of the TJPA's program, but no longer part of the DTX project.	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	1.5 - External Interface Coordination, Seventh bullet	CU	11/29/21	Edit to second to last bullet as follows: *Public and private utilities including SFPUC combined sewer system improvements.* Last bullet deleted	05/09/22	KS	A	Done	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	1.6 - Design Criteria Organization, Chapter 13 - Architecture	BP	11/30/21	Chapter 13 is no longer a standalone chapter for seismic design. It is indicated that Chapter 9 Geotechnical Requirements will include "seismic and ground motions performance criteria". Confirm that seismic design will also be folded into other applicable chapters (11,12 others?).	05/13/22	MM	DE	PMPC has decided to maintain Seismic as a standalone chapter.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	Section 1.6	CU	11/29/21	Add wayfinding signage to Chapter 13, Architecture	05/10/22	MJS	A	Added to Chapter 14, Architecture comments under GEC.001.	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	Section 1.7.1	CU	11/29/21	State regulations (e.g. CPUC) should be second bullet	05/13/22	MM	DE	Detailed lists of codes and regulations have been removed from Chapter 1; edit will be picked up in other chapters	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	Section 1.7.3.2	CU	11/29/21	add "FRA" to U.S. DOT bullet	05/13/22	MM	DE	Detailed lists of codes and regulations have been removed from Chapter 1; edit will be picked up in other chapters	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	Section 1.7.3.4	AG	11/29/21	Last bullet edited to read *San Francisco Public Utilities Commission Design Guidelines and Standards*	05/13/22	MM	DE	Detailed lists of codes and regulations have been removed from Chapter 1; edit will be picked up in other chapters				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	Section 1.1	PC	09/12/16	LEGACY Comment GEC16.002 - Do DTX underground station and ventilation buildings need to meet California Building Code (CBC)? If yes, we need to add CBC as the reference codes (especially for fire, life and safety or health related guidelines)	10/28/21	MM	DE	Detailed lists of codes and regulations have been removed from Chapter 1; edit will be picked up in other chapters	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.011	Section 1.2	PC	09/12/16	LEGACY Comment GEC16.003 - Add BART pedestrian tunnel component? Add new Transbay Transit Center Phase 2 component?	10/28/21	MJS	A	Section 1.2 will be replaced with the TJPA-approved DTX project description	8/5/2022	BCC	Even if deferred, the Connector is still part of the TJPA's program. The DTX design at the STC will still need to accommodate the future Connector.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.012	Section 1.6.2.3	RCCo	09/12/16	LEGACY Comment GEC16.004 - Add SF Planning "Better Street Plan" guidelines (adopted in 2011) for street/sidewalk design for any development in the public realm.	10/28/21	AG	A	Added: "San Francisco Planning Department, Better Streets Plan"	05/13/22	ROK		10/20/22	MJS	Section 1.6.2 was removed for the body of the DTX Design Criteria in Revision Book 02. A comprehensive list of all codes, standards, and regulations referenced within the DTX Design Criteria are provided in appendix B. The San Francisco Planning Department "Better Streets Plan" (2010) is included in the appendix but not referenced in the content of the criteria.	10/20/22	CC
GEC.013	Section 1.6.3.1 Page 1-7 of 9	SM	09/12/16	LEGACY Comment GEC16.005 - Operator standards for California Hi-speed rail authority shall be added	10/28/21	AG	A	Added bullets: "-Design Criteria -Environmental and Engineering Technical Memos -Notice to Designers"	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.014	Section 1.2 Page 1-1 of 9	LDG	09/12/16	LEGACY Comment GEC16.006 - 1.2 DTX Project Description needs to be expanded to include work from Mariposa Street to the Transit Center.	10/28/21	MJS	A	"Added 2 new bullets: • New U-Wall and tunnel stub box that will serve as temporary train storage, but will also accommodate a future grade separation tunnel (latter will be done by others) • New at-grade maintenance-of-way track and turnback track running adjacent to Seventh Street from Mariposa Street to Mission Bay Creek to facilitate operations" TO REPLACE WITH UPDATED DTX PROJECT DECRIPTION	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.015	Page 1-1 of 9	LDG	09/12/16	LEGACY Comment GEC16.007 - Add bullet to describe work from Mariposa Street to Caltrain Yard.	10/28/21	MJS	A	Section 1.2 will be replaced with the TJPA-approved DTX project description	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.016	Page 1-5 of 9	LDG	09/12/16	LEGACY Comment GEC16.008 - Correct title for General Order No.26-D: REGULATIONS GOVERNING CLEARANCES ON RAILROADS AND STREET RAILROADS WITH REFERENCE TO SIDE AND OVERHEAD STRUCTURES, PARALLEL TRACKS, CROSSINGS OF PUBLIC ROADS, HIGHWAYS AND STREETS.	10/28/21	AG	A	Revised title.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.017	Page 1-3 of 9	HC	09/12/16	LEGACY Comment GEC16.009 - Under the sub-heading of Chapter 11-Structures, "stations, bridges, buildings, and miscellaneous structures are lumped under "cut-and-cover structures". It is probably not intended. Please revise to clarify.	10/28/21	AG	A	Wording revised.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.018	Page 1-5 of 9	LDG	09/12/16	LEGACY Comment GEC16.010 - Correct title for General Order No. 72-B: RULES GOVERNING THE CONSTRUCTION AND MAINTENANCE OF CROSSINGS AT GRADE OF RAILROADS WITH PUBLIC STREETS, RODS AND HIGHWAYS IN THE STATE OF CALIFORNIA	10/28/21	AG	A	Revised title.	08/05/22	BCC	Not corrected on p 5-1, corrected on p 8-1	9/14/2022	MJS	Revised in Chapter 5, Codes and Standards.	9/14/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 51
Comments Closed 51
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 01, Overview*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team/Parsons)	AG	Brad Pollock (Design Team/Parsons)	BP
Chukwuma Umolu (Design Team/Parsons)	CU	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
Peter Chou (Design Team/Parsons)	PC	L. Godbold (Design Team/Parsons)	LDG
David Fung (Design Team/Robin Chiang & Co.)	DF	Henry Chang (Design Team/Structus)	HC
Sangyoon Min (Design Team/Parsons)	SM	James Deane (CHSRA)	JD
Tony Hargitay (CHSRA)	TH	Pete Gutierrez (Caltrain)	PCG
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS		

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.019	Page 1-6 of 9	LDG	09/12/16	LEGACY Comment GEC16.011 - Correct title for General Order No. 75-D: REGULATIONS GOVERNING STANDARDS FOR WARNING DEVICES FOR AT-GRADE HIGHWAY-RAIL CROSSINGS IN THE STATE OF CALIFORNIA	10/28/21	AG	A	Revised title.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.020	Page 1-6 of 9	LDG	09/12/16	LEGACY Comment GEC16.012 - Correct title for General Order No. 95: RULES FOR OVERHEAD ELECTRIC LINE CONSTRUCTION	10/28/21	AG	A	Revised title.	08/05/22	BCC	Not corrected on p 18-1	9/14/2022	MJS	Revised in Chapter 18, Codes and Standards.	9/14/2022	CC
GEC.021	Page 1-6 of 9	LDG	09/12/16	LEGACY Comment GEC16.013 - Correct title for GO 118: GENERAL ORDER No. 118-A REGULATIONS GOVERNING THE CONSTRUCTION, RECONSTRUCTION, AND MAINTENANCE OF WALKWAYS ADJACENT TO RAILROAD TRACKAGE AND THE CONTROL OF VEGETATION ADJACENT THERETO.	10/28/21	AG	A	Revised title.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.022	Page 1-6 of 9	LDG	09/12/16	LEGACY Comment GEC16.014 - Correct title for General Order No. 164: GENERAL ORDER No. 164-D RULES AND REGULATIONS GOVERNING STATE SAFETY OVERSIGHT OF RAIL FIXED GUIDEWAY SYSTEMS	10/28/21	AK	A	Revised General Order Number to GO 164-E, which supersedes GO 164-D.	08/05/22	BCC	No reference to GO-164 or 164-E found.	9/14/2022	MJS	Included in Chapter 3, System Safety and Security - codes and standards section: GO-164-E Rules and regulations governing state safety oversight of rail fixed guideway systems.	9/14/2022	CC
GEC.023	Section 1.2 Page 1-1 of 9	CU	10/18/18	LEGACY Comment GEC18.002 -	10/28/21	AG	A	Added: "(work to be done by others)" for each bullet.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.024	Section 1.2 Page 1-1 of 9	CU	10/18/18	LEGACY Comment GEC18.003 -	10/28/21	AG	A	Deleted.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.025	Section 1.2 Page 1-2 of 9	CU	10/18/18	LEGACY Comment GEC18.004 -	10/28/21	MJS	A	Section 1.2 will be replaced with the TJPA-approved DTX project description	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.026	Section 1.2 Page 1-2 of 9	CU	10/18/18	LEGACY Comment GEC18.005 - Add BART/Muni Pedestrian Connector	10/28/21	MJS	B	Section 1.2 will be replaced with the TJPA-approved DTX project description. The BART/Muni Pedestrian Connector has been deferred from the project per unanimous vote by the TJPA Board.	8/5/2022	BCC	Even if deferred, the Connector is still part of the TJPA's program. The DTX design at the STC will still need to accommodate the future Connector.	8/5/2022	KS	See response to GEC003, comment is closed.	8/5/2022	CC
GEC.027	Section 1.2 Page 1-2 of 9	CU	10/18/18	LEGACY Comment GEC18.006 -	10/28/21	MJS	A	Section 1.2 will be replaced with the TJPA-approved DTX project description	8/5/2022	ROK	Duplicate line/comment	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.028	Section 1.4 Page 1-2 of 9	CU	10/18/18	LEGACY Comment GEC18.007 - Add: The DTX shall accommodate connection to a future tunnel under Seventh Street and Pennsylvania Avenue.	10/28/21	AG	A	Added at end of last bullet: "…including futire tunnel connections"	8/5/2022	ROK					8/5/2022	CC
GEC.029	Section 1.6.2.2 Page 1-6 of 9	CU	10/18/18	LEGACY Comment GEC18.008 - Add: CPUC Requirements for Caltrain 25 kV AC Railroad Electrification System	10/28/21	AG	A	Added to CPUC list.	8/5/2022	ROK					8/5/2022	CC
GEC.030	Section 1.6.2.3 Page 1-6 of 9	DF	10/18/18	LEGACY Comment GEC18.009 - Add SF Planning "Better Street Plan" guidelines (adopted in 2011) for street/sidewalk designs	10/28/21	AG	A	Added: "San Francisco Planning Department, Better Streets Plan" (AK) Verified 2010 adoption (no superseding document) (MJS) PMPC Team made changes to the document that negate the orignal comment	8/5/2022	ROK					8/5/2022	CC
GEC.031	General	CU	10/18/18	LEGACY Comment GEC18.010 - Add CHSRA technical memoranda or design criteria for shared-corridor, low-speed operations.	10/28/21	AG	A	Added bullets: "-Design Criteria -Environmental and Engineering Technical Memos -Notice to Designers"	8/5/2022	ROK					8/5/2022	CC
GEC.032	General	PMPC	10/18/18	LEGACY Comment PMPC.004 - http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M170/K057/170057711.PDF	10/28/21	MJS	C	Noted, No update necessary	05/13/22	ROK					8/5/2022	CC
GEC.033	General	SL	10/18/18	LEGACY Comment GEC18.001 - These comments supplement those provided by the Design Team in Fall 2016.	10/28/21	MJS	C	Noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	8/5/2022	CC
HSR.001	General	JD	10/18/18	LEGACY Comment HSR18.074 - Recommend to not include any requirements that are already a regulatory requirement; e.g. NFPA 130, as those requirement change with code updates.	10/28/21	MJS	A	The PMPC team has removed redundant references to code wherever possible.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.002	General	JD	10/18/18	LEGACY Comment HSR18.079 - Need to reference climate Change evaluation and design criteria	10/28/21	MJS	A	See comment response to HSR18.073	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.003	General	JD	10/18/18	LEGACY Comment HSR18.085 - No comments on Transbay DTX Engineering Design Basis Report 20051216	10/28/21	MJS	C	Noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.004	General	JD	10/18/18	LEGACY Comment HSR18.086 - No comments on CHSRA-TJPA Train box Geometry Pkg_for FRA Signature 20130905	10/28/21	MJS	C	Noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.005	General	JD	10/18/18	LEGACY Comment HSR18.087 - No comments on Caltrain-TJPA Train box Geometry Pkg_for FRA Signature 20130905	10/28/21	MJS	C	Noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.006	General	TH	10/18/18	LEGACY Comment HSR18.088 - General Comment: The systems referred in the design have evolved significantly since 2009, when this specification was written. Please consider updating the specs to conform to current thinking and standards.	10/28/21	MJS	A	Agreed, Chapter 18 - Rail Systems and Chapter 19 - Communications references the Caltrain PCEP Design Criteria as the primary/governing document.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.001	Contents; (Pages ii through vii)	JP	06/30/22	footer: revise 'BOOK 1' to BOOK 2 on left side of page footer	08/31/22	KS	A	Editorial: All footers should be updated to reflect "BOOK 2"				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
Cal.002	Chapter 1 Section 1.7 & 1.8; (Page 1-6 of 7)	PCG	06/15/22	Chapter 1 - Overview - Part 1.7.2, 1.7.3, and 1.8.3 .Need to insure all current documents are properly described and any updates, revisions are incorporated prior to NTP of Final Design	08/31/22	MJS	C	The DTX Design Criteria is a living project document and will be updated periodically throughout project lifecycle to ensure references, codes and standards, and other related project documentation are accurate and current.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
Cal.003	Chapter 1 Section 1.8.2; (Page 1-6 of 7)	PCG	06/15/22	Anticipated NTP for Final Design?	08/31/22	MJS	C	The NTP for final design will depend on direction/decision from TJPA Board regarding the preferred contract packaging strategy approach, governance structure/document, and project master schedule. The exact timing, scope, and other details of the Final NTP will not be included in this document until such time as it has been decided.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC

Transbay Program
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Comments Closed 51
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
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Document date:	*10/28/2021*		

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
TA.001	Section 1.2, Project Description (second para)	LZ	07/04/22	Make it clear that although the project limit extends to Mariposa street, it is only the turnback tracks, not the whole alignment	08/31/22	KS	C	Editorial: The DTX Project Description has been approved by the GEC and TJPA and is consistent across all project documents. No change needed.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.002	Section 1.2, Project Description (third para)	LZ	07/04/22	Specify "surface streets" as 16th St and Mission Bay Drive	08/31/22	KS	C	Editorial: The DTX Project Description has been approved by the GEC and TJPA and is consistent across all project documents. No change needed.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.003	Section 1.2, Project Description (Cut-and-Cover structures, second bullet)	LZ	07/04/22	Add "crossover" before tunnel	08/31/22	KS	C	Editorial: The DTX Project Description has been approved by the GEC and TJPA and is consistent across all project documents. No change needed.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.004	Section 1.2, Project Description (Fourth and Townsend Street Station)	LZ	07/04/22	Add 'restrooms" to passenger amenities at the station	08/31/22	KS	A	Will add				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC
TA.005	Section 1.3, DTX Project Goals (first para)	LZ	07/04/22	Delete "the following" at the end of the sentence	08/31/22	KS	A	Editorial: Revised as noted				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC
TA.006	Section 1.7, DTX Projectwide Codes, Standards, and Guidelines	LZ	07/04/22	Precedence for application of codes shows operator's criteria trumping city codes. Not sure that is correct	08/31/22	MJS	A	The order of this list of precedence will be revised as follows: 1. Federal Requirements 2. Statewide regulations 3. City codes (as applicable) 4. Operator criteria, requirements, and technical memoranda 5. Specific industry code or standard 6. California Building Code				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.007	Section 1.7, DTX Projectwide Codes, Standards, and Guidelines	LZ	07/04/22	Why was the list of regulations deleted? it is true that other regulations may apply, but that can be handled with a statement that the list is representative but not necessarily all-inclusive	08/31/22	MJS	C	The list of regulations was removed from Chapter 01, Overview because it was deemed unnecssary and redundant as each chapter provides a list of codes, standards and regulations relevant to that topic/discipline. **The PMPC maintains a complete list of all references and will include as an appendix in final submission.**				10/17/22	KS	Agree. Appendix B will list all standards, codes etc.	10/17/22	CC
TA.008	Section 1.8, Variances and Changes to Design Criteria	LZ	07/04/22	First sentence is truncated. Include what?	08/31/22	KS	A	Clarfied sentence				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC
TA.009	Section 1.8.2, Change Control	LZ	07/04/22	States that changes need to be approved by the TJPA. Should say by the Change Control Board (or Configuration Management Board) and the TJPA	08/31/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 86
Comments Closed 86
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 02, Owner's Requirements*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Chukwuma Umolu (Design Team/Parsons)	CU	Henry Chang (Design Team/Structus Inc.)	HC
Carl Woods (Design Team/Parsons)	CFW	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
Peter Chou (Design Team/Parsons)	PC	E. Mortlock (Design Team/Parsons)	EM
Yiming Sun (Design Team/McMillan Jacobs Ass.)	YS	David Fung (Design Team/Robin Chiang & Co.)	DF
Uhila Makon (Caltrain)	UM	Bin Zhang (Caltrain)	BZ
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Andrew Clapham (CHSRA)	AC	James Deane (CHSRA)	JD
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M. Brunner (CHSRA)	MBr	X. Banko (CHSRA)	XB
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS		

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GEC.001	Chapter 2; 2.1.2.b	CU	04/26/22	Have minimum headways and dwell times below been coordinated?	5/13/2022	MM	A	Edited table to just include the scheduled minimum as provided by the operators.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.002	Chapter 2; 2.1.3	CU	04/26/22	Cite CHSRA and Caltrain business plans if these are the sources of these numbers and which documents govern.	5/16/2022	MM	A	Ridership section has been updated to request designer to verify ridership ahead of design work with TJPA.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.003	Chapter 2; 2.3.2.a	CU	04/26/22	Please clarify that CHSRA train platform lengths will be limited to single train sets at STC and 4th & Townsend and that operational means will be employed for passenger access for double train sets. Provide minimum length for single train set. Cite requirements at STC agreed-to by letter, to accommodate second trainset in clear space within throat. For 4th & Townsend, the second trainset shall be accommodated east of the station	5/13/2022	MM	A	Text updated in accordance with CHSRA letter regarding the use of 800 ft platforms and use of single consist.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.004	Chapter 2; 2.5 para. 1	CU	04/26/22	This work is no longer part of the DTX project but the project must coordinate with any such reconfiguration by others	5/16/2022	MM	A	Agree. Text has been updated to reflect the modification to the at-grade trackwork and its associated impacts to Caltrain operations.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.005	Chapter 2; 2.5 para. 3	CU	04/26/22	Include Muni light rail operations	5/13/2022	MJS	A	Revised to read as follows: "The staging and implementation of the mainline DTX construction in city streets must be coordinated with the City of San Francisco Department of Public Works, Muni light rail operations, and the San Francisco Municipal Transportation Agency to minimize disruption to surface traffic and communities."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.006	Chapter 2	HC	09/12/16	LEGACY Comment GEC16.015 - Under the heading of 2.7.2 "Allowable Infiltration Rates": The criteria and Table 2.6 are not closely related to structural design but more closely related to architectural/waterproofing criteria and should be moved to Section 2.8 Architecture.	4/6/2022	MJS	B	Table 2.6, Permissible Infiltration Rates will remain under Section 2.7 Structural	8/5/2022	PAR	The response is not consistent with the Chapter 2_Owner's Requirements(Clean) as Section 2.7 was completely removed.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	2.1 (Table)	CFW	09/12/16	LEGACY Comment GEC16.016 - Remove reference to Caltrain (in-line) from: Table 2.1 Dwell Times No provision for in-line operation at TTC.	4/6/2022	AG	A	Removed.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.008	Section 2.3.1	RCCo	09/12/16	LEGACY Comment GEC16.017 - 4th & Townsend UG Station 700' Platform length is shorter than the proposed train lengths.	4/6/2022	MJS	C	Design has developed further since initial comment. Platform length now 875'.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.009	Section 2.3.1	RCCo	09/12/16	LEGACY Comment GEC16.018 - Are both types of commuter trains still consider (given recent news EMU have been selected).	4/6/2022	AG	A	EMU's have been selected. Locomotive criteria removed from text and Table 2.4.	8/5/2022	ROK		8/5/2022	MJS	PMPC Team agreed to update content based on original comment. No backcheck response was received, therefore this comment is considered closed.	8/5/2022	CC
GEC.010	Section 2.3.2	CFW	09/12/16	LEGACY Comment GEC16.019 - Total train length 400 meters = 1312' Value is correct in: Table 2.5 High-speed Train Rolling Stock Parameters	4/6/2022	AG	C	See CHSRA 2018 comment #28 and 29; length = 1,345'.	8/5/2022	ROK	Also make distinction between single and double train sets, and their respective lengths, since platforms are sized for single consists.	8/5/2022	MJS	PMPC Team agrees to update content. No backcheck response was received, therefore this comment is considered closed.	8/5/2022	CC
GEC.011	Section 2.7.3	PC	09/12/16	LEGACY Comment GEC16.020 - Is there a specific fire time-temperature curve or fire load that our structure should be designed? We should clearly refer Ch. 22 as design criteria at the end.	4/6/2022	AG	A	Added: "The DTX tunnels and stations shall be designed to accommodate the fire scenarios provided in Section 22.1".	8/5/2022	ROK		8/5/2022	MJS	PMPC Team agreed to update content based on original comment. No backcheck response was received, therefore this comment is considered closed.	8/5/2022	CC
GEC.012	Section 2.8.2	RCCo	09/12/16	LEGACY Comment GEC16.021 - Request confirmation from Caltrain if "Extreme passenger load conditions for civic and sports …." are envisioned / required for the new 4th & Townsend UG Station (none currently).	4/6/2022	AG	A	See 2018 comment #21.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.013	2.8.3	RCCo	09/12/16	LEGACY Comment GEC16.022 - Currently no sustainability performance goals are established – is this still current, if not update accordingly per what standards (City Of SF requires LEED Certification for all public projects).	4/6/2022	AK	A	Added: "Sustainable design opportunities in the areas of water savings, materials selection, and the use of recycled materials should be considered. Also, for areas affected by the presence of groundwater, methods to reduce power consumption related to dewatering pumping over the project's life cycle will be evaluated."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.014	2.1.1/2-1	EM		LEGACY Comment GEC18.011 - Second bullet point; recommend a check is made of the status of Caltrain's Back Up Central Control facility (BCCF). There was an intent to transfer primary control from San Jose CCF to the BCCF. If primary control has not yet been transferred recommend adding a second sentence to this bullet of; "Back up train control is provided for from the BCCF located in Menlo Park.:	4/6/2022	MJS	A	Updated text to read as follows: "The primary train control facility for the DTX will be located within the Caltrain Central Control Facility located outside of the DTX project."	8/5/2022	ROK	Concur	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.015	2.1.1/2-1	EM		LEGACY Comment GEC18.012 - In the 3rd bullet the term will should be shall as the mimic will be provided as part of the scope of this project?	4/6/2022	AG	A	Revised text.	8/5/2022	ROK	Concur	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.016	Section 2.1.2 Train Operations, Page 2-1 of 9	CU		[illegible] c. The Fourth and Townsend Street Station shall accommodate Caltrain service only. The expected dwell time at the Fourth and Townsend Street Station is 1 minute. Update to add CHSRA service: Update dwells	4/6/2022	AG	A	Revised text to read: "…shall accommodate both Caltrain commuter and high-speed train service."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.017	Table 2.1, Transit Center Dwell Times, Page 2-1 of 9	CU		LEGACY Comment GEC18.014 - Update dwell times	4/6/2022	AG	A	In-line dwell time removed, verify Caltrain values in table.	8/5/2022	ROK	Verify operator values.	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.018	2.1.2 f & 20.1	DF		LEGACY Comment GEC18.015 - States the Fourth and Townsend Street Station shall accommodate Caltrain service only. Confirm and update current station design if for Caltrain only or Caltrain & CHSRA	4/6/2022	AG	A	Revised text to read: "…shall accommodate both Caltrain commuter and high-speed train service."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.019	2.1.3 Table 2.2	DF		LEGACY Comment GEC18.016 - Update Ridership projections	4/6/2022	MJS	A	Figures for CHSRA updated based on Base Case 2020 BP Phase 1 - 2040 Horizon. Updated Caltrain ridership projections are still needed	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.020	Section 2.3.1 Commuter Trains, Page 2-3 of 9	CU		LEGACY Comment GEC18.017 - Update: EMU's only, 10 car trains, 875' train length.	4/6/2022	MJS	A	Removed third sentence of first bullet	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.021	2.3.1	DF		LEGACY Comment GEC18.018 - Update commuter trains types & lengths	4/6/2022	AG	A	Locomotive coaches and info removed from text and Table 2.4	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.022	Section 2.3.2 High-Speed Trains, Page 2-4 of 9	CU		LEGACY Comment GEC18.019 - Update per latest available CHSRA rolling stock requirements	4/6/2022	MJS	A	Table 2.5 Added with data	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC

Transbay Program
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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 02, Owner's Requirements*		
Document date:	*4/6/2022*		

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GEC.023	Sect. 2.6	YS		LEGACY Comment GEC18.020 - Do the owner's seismic performance specify the return periods associated with OBE and MDE?	4/6/2022	MJS	A	Seismic performance requirements have been removed from chapter 2 and consolidated in Chapter 10 - Seismic Design. AASHTO (FEE and SEE) earthquake events will govern design.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.024	Section 2.8.2 Station Passenger Demands, Page 2-7 of 9	CU		Extreme passenger load conditions for civic and sporting events shall be accommodated by adjustments to the station operations. The DTX design shall not directly facilitate these special operating conditions. Re-visit based on latest coordination with Caltrain	4/6/2022	AK	A	What specific language should be added? Needs further coordination/alignment with Caltrain.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.025	2.8.2	DF		LEGACY Comment GEC18.022 - Confirm status quo that the station design does NOT have to account for 'extreme passenger load conditions for civic & sporting events' and/or update accordingly	4/6/2022	AK	B	Caltrain will have to write new procedures to handle both special events and emergencies for the Fourth and Townsend Station.	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.026	2.8.3	DF		LEGACY Comment GEC18.023 - Confirm status quo 'no specific sustainability performance goals have been established for the DTX project' and/or update accordingly	4/6/2022	AK	A	Repeat of comment GEC16.022: Added: "Sustainable design opportunities in the areas of water savings, materials selection, and the use of recycled materials should be considered. Also, for areas affected by the presence of groundwater, methods to reduce power consumption related to dewatering pumping over the project's life cycle will be evaluated."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.027	2.8.4	DF		LEGACY Comment GEC18.024 - Confirm status quo 'Arts for Transit' is not required at the Fourth & Townsend Station and/or update accordingly	5/16/2022	MM	C	TJPA does not have specific art requirements at the Fourth and Townsend St. Station as TJPA has an extensive art program at the Salesforce Transit Center; however, it is TJPA's expectation that some amount of art will be included in the final station design.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.028	2.9/2-8	EM		LEGACY Comment GEC18.025 - PB (now WSP) was drafting updates to CPUC GO 95 from 2009 onwards. Recommend a check is made to determine if this updated GO has been published.	4/6/2022	AG	A	Deleted last paragraph, added CPUC SED-2 in 1st paragraph.	8/5/2022	ROK	Concur	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.029	Section 2.9 Electrification, Page 2-8 of 9	CU		LEGACY Comment GEC18.026 - Update per Comment #7	4/6/2022	AG	A	Deleted last paragraph, added CPUC SED-2 in 1st paragraph.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.030	2.10/2-8	EM		LEGACY Comment GEC18.027 - Owner's Requirements; Signals and Train Control - Extend the first sentence with: "as modified by the requirements of the Caltrain Electrification Program" this will make this section consistent with other systems sections.	4/6/2022	AG	A	Added.	8/5/2022	ROK	Concur	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.031	2.10/2-8	EM		LEGACY Comment GEC18.028 - Add a 4th paragraph as follows; "The signal block design shall be coordinated with the tunnel ventilation design to meet the criteria of the maximum number of trains in ventilation section.	4/6/2022	AG	A	Added.	8/5/2022	ROK	Concur	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.032	Section 2.10 Signals and Train Control	CU		Transit Center platforms and tail track signals shall allow for adding and cutting cars. Delete **2.11 Highway Rail Grade Crossings**	4/6/2022	AG	A	Deleted.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.033	Section 2.12 Ventilation, Page 2-9 of 9	CU		LEGACY Comment GEC18.030 - Add: shall be coordinated with signal system per NFPA 130.	4/6/2022	AG	A	Revised text to read: "…ventilation system shall be coordinated with signal system per NFPA and take into account…"	8/5/2022	BCC	This was not completed.	8/31/2022	MJS	This section was removed from chapter 2. Chapter 16, Mechanical Systems and Chapter 18, Rail Systems includes language for requiring coordination of ventilation system and signaling system conforming to NFPA 130.	10/05/22	CC

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Comments Closed	**86**
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Cal.001	Chapter 2.1.1	UM	04/29/22	Reference to Caltrain's primary train control facility is Menlo Park Control Center. The backup location is San Jose Control Center. Any modifications to the primary location should be made to back up location.	5/13/2022	MJS	A	Revised to read as follows: "The primary train control facility for the DTX will be located within Caltrain's Central Control Facility (CCF) located outside of the DTX project. Any modifications to the CCF resulting from integrating the DTX must also be made to Caltrain's backup facility in San Jose.'	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Section 2.1.2	BZ	10/18/18	LEGACY Comment Cal18.001 - 2.1.2.f : Verify whether HSR will make a stop at Fourth and Townsend Street Station	4/6/2022	MJS	A	California High-Speed Rail will stop at Fourth and Townsend Street Station 4x per peak hour per direction based on latest 2020 Business Plan. Revised to read as follows: "The Fourth and Townsend Street Station shall accommodate Caltrain and high-speed rail service."	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.003	Section 2.3 Table 2.3	HL	10/18/18	LEGACY Comment Cal18.002 - Table 2.3 "DTX Infrastructure Minimum Design Life", second line item "Above-grade facilities, including bridges, .." Railway bridge should be designed for a 100-year life.	4/6/2022	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 1-9]: Major civil structures (including bridges) shall be designed for 100-years.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.004	Section 2.3 Table 2.3	HL	10/18/18	LEGACY Comment Cal18.003 - Table 2.3 "DTX Infrastructure Minimum Design Life" Please include the design life for trackwork	4/6/2022	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 1-8]: Track Systems involving the following components shall be designed for 50-years: Rail, Fastening System, Ties, Ballast, Subballast, and Subgrade.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.005	Section 2.3.1	BZ	10/18/18	LEGACY Comment Cal18.004 - 2.3.1 (first bullet): "Bi-level electric multiple unit (EMU) train sets. During peak service, these may be as long as eight cars, for a total train length of 705 feet. [ZB]10-car consists will be operated during the peak service, for a total length of 875 feet. [DK] To clarify, 10-car consists could at some future point be run given the 875 foot platforms being designed. JPB has not currently committed to this as service planning is ongoing as part of our business plan.	4/6/2022	MJS	B	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 3-10]: "Platform length: The standard platform length shall be 875 feet to accommodate a 10-car EMU consist. See Figure 3-5.." Caltrain minimum platform length will be updated throughout the design criteria to 875 feet (10-car consist).	5/16/2022	ROK		05/16/22	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.006	Section 2.8.3	BZ	10/18/18	LEGACY Comment Cal18.005 - "CALTRAIN STATIONS AND FACILITIES SUSTAINABILITY DESIGN CRITERIA" (See Appendix G in Caltrain Design Criteria) should be added in the design criteria.	4/6/2022	MJS	B	Caltrain design standards reference the CBC for sustainability design. As most of DTX facilities are underground, this code does not apply and is infeasible.				05/16/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with the applicable criteria; therefore this comment is considered closed.	05/16/22	CC
Cal.007	Section 2.11	RB	10/18/18	LEGACY Comment Cal18.006 - CPUC General Order 88-B must be filed prior to permanent and temporary modifications to existing crossings.	4/6/2022	MJS	C	CPUC GO 88-B was created with the purpose to establish criteria for alteration of existing public highway-rail crossings.				05/16/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with the applicable criteria; therefore this comment is considered closed.	05/16/22	CC
Cal.008	Chapter 2 Section 2.3.3; (Page 2-4 of 5)	PCG	06/15/22	Will ventilation be adequate and will diesel equipment be required to be equipped with scrubbers? Will HiRail inspection vehicle be electric?	10/10/2022	MJS	A	Revised last sentence of section as follows: "Operating procedures will need to be written and approved by the operators for to ensure adequate ventilation and the safe operation of diesel-powered locomotives in the DTX tunnel."				10/10/2022	MJS	The responder (PMPC Team) has confirmed that the criteria is compliant with the applicable criteria; therefore this comment is considered closed.	10/10/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 86
Comments Closed 86
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 02, Owner's Requirements*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Chukwuma Umolu (Design Team/Parsons)	CU	Henry Chang (Design Team/Structus Inc.)	HC
Carl Woods (Design Team/Parsons)	CFW	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
Peter Chou (Design Team/Parsons)	PC	E. Mortlock (Design Team/Parsons)	EM
Yiming Sun (Design Team/McMillan Jacobs Ass.)	YS	David Fung (Design Team/Robin Chiang & Co.)	DF
Uhila Makon (Caltrain)	UM	Bin Zhang (Caltrain)	BZ
Rick Bartholomew (Caltrain)	RB	Pete Gutierrez (Caltrain)	PCG
Andrew Clapham (CHSRA)	AC	James Deane (CHSRA)	JD
Paul Hebditch (CHSRA)	JD	Luis Zurinaga (SF CTA)	LZ
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Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS		

AC – Action Code
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.001	Chapter 2, 2.1.1 - Operations Control	AC	04/22/22	Why are the 'Caltrain Central Control Facility' location(s) not specified in this section of the DCM?	5/13/2022	MJS	A	Revised per Comment #Cal.001 as follows: "The primary train control facility for the DTX will be located within Caltrain's Central Control Facility (CCF) located outside of the DTX project. Any modifications to the CCF resulting from integrating the DTX must also be made to Caltrain's backup facility in San Jose."	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.002	Chapter 2, 2.1.1 - Operations Control	AC	04/22/22	Has the provision of the emergency mimic train control facility at the Salesforce Transit Center been considered fully from the perspective of the interface with CEMOF/Menlo Park, in terms of control authority, operability, safety etc.?	5/16/2022	MM	C	Caltrain is still assessing their needs with regards to the emergency mimic train control facility. TJPA is working closely with Caltrain on the systems related submittals to ensure Caltrain's needs are met. If a criteria becomes available, it will be included in the next issue of the design criteria.				5/16/2022	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.003	Chapter 2, Table 2-1 Dwell Times	AC	04/22/22	The CHSR dwell times at the Transbay Center station specified in this table contradict the Phase 1 Service Plan Technical Memoranda - TM states a requirement of 30 minutes	5/16/2022	MM	A	Agree. Dwell times have been updated to 20 minutes for both Caltrain and CHSRA in accordance with values provided in the Phasing Study Operations Analysis.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.004	Chapter 2, Table 2-3 Minimum Design Life	AC	04/22/22	25 years as a blanket minimum design life is not reasonable/achievable for all train control assets - this is also not in accordance with the Caltrain Design Guidelines (Chapter 1)	5/16/2022	MM	A	Updated in accordance with Caltrain Design Guidelines Chapter 1.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.005	Chapter 2, 2.3.2 - High Speed Trains	AC	04/22/22	Where have the acceleration and deceleration rates referenced in this section to inform the signaling layout design been derived from? These do not align with the HSR rolling stock specification, or the technical memoranda.	5/24/2022	MM	C	CHSRA has responded via email from Tom Newey on 5/24/22 that the rates will be included in CHSRA's upcoming vehicle procurement. The values will be removed from the DTX Design Criteria and a reference will be made to the future vehicle procurement providing this information.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.006	Chapter 2, 2.5 - Operations During Construction	AC	04/22/22	Acceptable level of service' in terms of construction impact on operations would benefit from being defined more clearly. Either a specified level of acceptable performance impact could be stated, or a process that must be followed to mitigate operations impacts could be specified.	5/16/2022	MM	C	This information will be provided in the bid documents for each construction package as the impacts may differ based on agreements with appropriate stakeholders.				5/16/2022	MM	The responder (PMPC Team) has provided a response that is acceptable to TJPA; therefore this comment is considered closed.	05/16/22	CC
HSR.007	Chapter 2, 2.6 - Guideway inspection and maintenance	AC	04/22/22	This section would benefit from a statement regarding which organization is expected to inspect and maintain the infrastructure. Unclear whether an organization within the TJPA or the PCJPB will be responsible. If this is not suitable for inclusion here, a reference to a document detailing the breakdown of responsibilities between all relevant parties for maintenance of all assets would be sensible.	5/16/2022	MM	C	A governance study is underway. The next revision of the design criteria can include any agreements made therein.				5/16/2022	MM	The responder (PMPC Team) has provided a response that is acceptable to TJPA; therefore this comment is considered closed.	05/16/22	CC
HSR.008	Chapter 2, pare 2.1.2 b	PH	05/02/22	CHSRA normal revenue operating hours are 6:00 a.m. to midnight every day of the week. Please revise weekend hours to align with this.	5/16/2022	MM	A	Opening time has been updated to 6 am on weekends, the closing time is consistent with planned TJPA operations at the stations. It will be updated in the next revision of the design criteria based on governance conversations which are on-going.				5/16/2022	MM	The responder (PMPC Team) has provided a response that is acceptable to TJPA; therefore this comment is considered closed.	05/16/22	CC
HSR.009	Chapter 2, para 2.1.2 d	PH	05/02/22	Note that this headway applies to each track individually	5/13/2022	MJS	A	Revised to read as follows: "Track and signal layout must accommodate a minimum capacity of 2-minute 45-second headways for combined Caltrain commuter and CHSRA high-speed service on each track in each direction during the peak period. "	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.010	Chapter 2, para 2.1.2 f	PH	05/02/22	Minimum dwell time of 2 mins is correct for CHSRA, but TJPA should check with Caltrain for their minimum time as this may be shorter	5/16/2022	MM	C	Caltrain has provided a dwell of 2 minutes for all operations analysis that have been performed.	5/16/2022	ROK		05/16/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/16/22	CC
HSR.011	Chapter 2, Table 2-1	PH	05/02/22	For consistency, either delete "(Stub End)" from Caltrain row or add it to CHSRA row. Also consider amending table to include Fourth and Townsend dwell times for completeness	5/13/2022	MJS	A	Revised as noted (removed "Stub End")	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.012	Chapter 2, para 2.1.3	PH	05/02/22	I propose that these numbers are reviewed and updated with the figures being used in the FTA funding submission.	5/16/2022	MM	A	Ridership section has been updated to request designer to verify ridership ahead of design work with TJPA.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.013	Chapter 2, para 2.3.2	PH	05/02/22	Revise a. to describe a single high-speed trainset at 205m. Add b. stating that, "The DTX shall be designed to accommodate HSR services comprising a double trainset with a total length of 405m."	5/16/2022	MM	A	Text updated in accordance with CHSRA letter regarding the use of 800 ft platforms and use of single consist.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.014	Chapter 2, para 2.3.2, second para after Table 2-5	PH	05/02/22	Why, even after allowing for baggage, are HSR passengers heavier than Caltrain passengers?	5/18/2022	MM	A	Agree. Updated criteria to meet FAA standards (210 lbs. including baggage).	5/18/2022	ROK		5/18/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/18/22	CC
HSR.015	Chapter 2, para 2.3.2, final para	PH	05/02/22	Delete sentence referring to yard circulation tracks as the DTX has no such tracks. Revise second sentence to make clear that the minimum acceptable horizontal curve radius is 650' and the maximum acceptable gradient is 3%. (You may wish to align the wording here with that used in Track chapter of the DCM.) I also note that no curve or gradient criteria are included in section 2.3.1 covering Commuter trainsets.	5/16/2022	MM	A	Agree, removed paragraph for consistency with Commuter trainset section. Guideway geometrics are included in Ch. 7.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.016	Chapter 2, para 2.3.3	PH	05/02/22	An additional sentence should be added here to note the operating procedures will need to be written and approved by the operators for the safe operation of diesel trains on the DTX. Are you sure that use of diesel maintenance and recovery trains is acceptable under NFPA 130?	5/17/2022	MM	A	Agree. Sentence has been added as well as a requirement for the use of the ventilation system during operation of diesel trains. 2020 NFPA 130 acknowledges the use of "nonelectric" vehicles. Specifically, Chapter 1 Administration states that NFPA is applicable to the design of rail system as follows: 1.3.4 This standard shall also apply as a basis for fixed guideway transit and passenger rail systems where nonelectric and combination electric-other (such as diesel) vehicles are used. Where such vehicles are not passenger-carrying vehicles or are buses or trolley coaches, the standard shall not apply to those vehicles but shall apply to the fixed guideway transit and passenger rail systems in which such vehicles are used. Based on the paragraph above, it's clear that NFPA 130 recognizes and allows for the use diesel maintenance and recovery trains.	5/18/2022	ROK		5/18/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/18/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**86**
Comments Closed	**86**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 02, Owner's Requirements*		
Document date:	*4/6/2022*		

Reviewers

Name	Initials	Name	Initials
Chukwuma Umolu (Design Team/Parsons)	CU	Henry Chang (Design Team/Structus Inc.)	HC
Carl Woods (Design Team/Parsons)	CFW	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.017	Chapter 2, para 2.5	PH	05/02/22	Add a sentence, "CHSRA is not expected to begin operations until construction of the DTX is complete. However should this situation change then efforts must be made to maintain an acceptable level of service for CHSRA during construction."	5/16/2022	MM	A	Agree. Text added to note that operations include a potential interim station at Fourth and King Street Station for CHSRA.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.018	Section 2.1.2.b/ 2-1	PH		LEGACY Comment HSR18.008 - Weekend leisure travel is likely to be a big market for HSR s consideration may want to be given to an earlier start than 7am	5/16/2022	MM	A	See response to Comment HSR.008.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.019	Section 2.1.2.c/ 2-1	PH		LEGACY Comment HSR18.009 - European rail experience would suggest that for long distance high speed travel Sunday afternoon / evening will also have peak loadings	5/16/2022	MM	C	Noted. Though since Caltrain service does not have a peak that coincides with Sunday afternoon, the use of a peak period CHSRA service plan (4 trains per hour per direction) on Sunday afternoon will not constitute peak level service for the DTX tunnel.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.020	Section 2.1.2.d/ 2-1	PH		LEGACY Comment HSR18.010 - Revise this clause to require "headways of no more that 2min 45sec"	4/6/2022	AG	A	Revised as noted.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.021	Table 2.1, 2-1	PH		LEGACY Comment HSR18.011 - CHSR dwell times should be Absolute minimum 15 min and Scheduled minimum 20 min	4/6/2022	AG	A	Revised as noted.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.022	Section 2.1.2.f/ 2-1	PH		LEGACY Comment HSR18.012 - Provision for CHSR to call at 4th and Townsend must be made, with dwell times of 2 mins	4/6/2022	MJS	A	Section 2.1.2.f revised to read as follows: "The Fourth and Townsend Street Station shall accommodate Caltrain and high-speed rail service. The expected minimum dwell time at the Fourth and Townsend Street Station is two (2) minutes."	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.023	Section 2.10, 2-8	PH		LEGACY Comment HSR18.013 - Include note requiring that the train control system be compliant with positive train control requirements	4/6/2022	AG	A	Revised 1st paragraph, 1st sentence to read: "…shall be an extension of the Caltrain system and as such, compliant with positive train control requirements."	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.024	Section 2.13.3, 2-9	PH		LEGACY Comment HSR18.014 - Add after first sentence - Where reasonably practicable remote condition monitoring equipment shall be used	4/6/2022	AG	A	Added.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.025	Section 2.3.1, 2-3	MBr		LEGACY Comment HSR18.022 - 2.3.1 Commuter Trains - Average Electric locomotive length is 72' ~ 67', EMU average maximum power per powered Bi Level EMU is 2.2 MVA if a 8 car consist has 4 trailers (non-powered) the average power will be 1.1 MVA per car. Change go 8.8 MVA per train.	5/18/2022	MM	DE	Measurements have been updated per static envelope from Stadler. Wheel power output has been updated per Stadler's website.				5/18/2022	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/18/22	CC
HSR.026	Table 2.4, 2-3	MBr		LEGACY Comment HSR18.023 - Table 2.4 Caltrain Rolling Stock Parameters - Bi-Level EMU Tare Weight approximately 120,000 lbs.	4/6/2022	MJS	A	Revised table (content moved to Chapter 18 - Rail Systems)	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.027	Section 2.3.1, 2-4	MBr		LEGACY Comment HSR18.024 - 2.3.1 Commuter Trains - braking rates for all types of rolling stock from speeds of 100-0 mph shall be 1.7 mph/sec full service and 2.0 mph/sec emergency on level tangent dry track as a minimum	4/6/2022	MJS	A	Revised as noted.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.028	Section 2.3.1, 2-4	MBr		LEGACY Comment HSR18.025 - 2.3.1 Commuter Trains - ALP-46 locomotive, an adhesion rate of 33% shall be assumed for load flow purposes. An adhesion rate of 7% (Needs clarification?)	4/6/2022	AG	C	Deleted paragraph; EMUs to be used.				05/13/22	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.029	Section 2.3.2, 2-4	XB		LEGACY Comment HSR18.026 - 2.3.2 - replace reference to the "ICE (Velaro) model" as follows…"are currently based upon candidate wide-body HSR trainsets."	4/6/2022	AG	A	Revised text as directed.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.030	Section 2.3.2.a, 2-4	XB		LEGACY Comment HSR18.027 - 2.3.2 a - single trainset length to be increased to 205 meters, Double traction trainset length to be increased to 410 meters. To be confirmed with future trainset procurement contract.	4/6/2022	AG	A	Updated lengths.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.031	Section 2.3.2.b, 2-4	XB		LEGACY Comment HSR18.028 - 2.3.2 b - total trainset length to be increased to 1,345 feet (double traction).	4/6/2022	AG	A	Updated length.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.032	Table 2.5, 2-4	XB		LEGACY Comment HSR18.029 - DOUBLED TRACTION 410 METER TRAINSET Table 2.5 - requires updates as follows: Length (ft) = 1,345 Width (ft) = 11.084 Height (ft) = 15 (Over locked down pantograph) Weight (lbs.) = (AW0) 1,920,000 ~ 60 US Tons / car Aux. Power (kW) = 1600 Traction Max. Output Power at rail (kW) = 22,000 Performance Criteria to be released with future trainset procurement contract.	4/6/2022	AG	A	Updated Table 2.5.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.033	Section 2.3.2, 2-4	XB		LEGACY Comment HSR18.030 - 2.3.2 - Average passenger weight (including luggage = 15 pounds) to be increased to 215.5 pounds.	4/6/2022	MJS	A	Revised as suggested	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.034	Section 2.3.2, 2-4	XB		LEGACY Comment HSR18.031 - Trainset decelerations rates: braking rates from speeds of 100-0 mph shall be 1.7 mph/sec full service and 2.0 mph/sec emergency on level tangent dry track as a minimum. Trainset Acceleration rate: shall be 1.3 mph/sec from 0 mph to 60 mph	4/6/2022	AG	A	Revised numbers.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.035	Table 2.2, 2-2	JD		LEGACY Comment HSR18.072 - CHSRA to provide updated ridership based on 2018 Business Plan for Salesforce and 4th & Townsend	5/16/2022	MM	A	Ridership section has been updated to request designer to verify ridership ahead of design work with TJPA.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.036	Section 2.4, Chapter 2 General	JD		LEGACY Comment HSR18.073 - Need to include Climate Change evaluation criteria	4/6/2022	MJS	A	This section has been updated to reflect design considerations required for the 100-year storm event with sea level rise over the project life (100-years).	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.037	Section 2.1.2.f, 2-1 & Section 20.1, 20-1	XB		LEGACY Comment HSR18.021 - 2.1.2 F and 20.1 - Confirm that the Fourth and Townsend Street Station is to accommodate Caltrain service only. HSR requires usage at the Fourth and Townsend Station.	4/6/2022	AG	A	Revised text to read: "…shall accommodate both Caltrain commuter and high-speed train service."	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
TA.001	Section 2.1.3, Ridership	LZ	07/04/22	Why was the ridership table removed?	8/31/2022	MJS	C	The ridership data was removed because the data provided from Caltrain and CHSRA was not completed/executed consistently. Ridership data will need to be updated based on updated inputs and post-COVID figures and verified by TJPA prior to inclusion in the DTX Design Criteria.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.002	Section 2.3.1, Commuter Trains (first para)	LZ	07/04/22	States that criteria "assumes that Caltrain trains". No need to assume Caltrain trains are under production and some have been delivered. All information about them is readily availabe, no need for assumptions	8/31/2022	KS	A	Editorial: PMPC to update accordingly				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 86
Comments Closed 86
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 02, Owner's Requirements*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Chukwuma Umolu (Design Team/Parsons)	CU	Henry Chang (Design Team/Structus Inc.)	HC
Carl Woods (Design Team/Parsons)	CFW	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
Peter Chou (Design Team/Parsons)	PC	E. Mortlock (Design Team/Parsons)	EM
Yiming Sun (Design Team/McMillan Jacobs Ass.)	YS	David Fung (Design Team/Robin Chiang & Co.)	DF
Uhila Makon (Caltrain)	UM	Bin Zhang (Caltrain)	BZ
Rick Bartholomew (Caltrain)	RB	Pete Gutierrez (Caltrain)	PCG
Andrew Clapham (CHSRA)	AC	James Deane (CHSRA)	JD
Paul Hebditch (CHSRA)	JD	Luis Zurinaga (SF CTA)	LZ
M. Brunner (CHSRA)	MBr	X. Banko (CHSRA)	XB
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS		

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment
PAR - Parsons internal

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
TA.003	Section 2.3.1, Commuter Trains (Table 2-4)	LZ	07/04/22	It may be more useful to use seated capacity and standing capacity instead of standing sq feet available	8/31/2022	MJS	B	The Caltrain EMU Design Parameters (Table 2.3) were taken directly from the Stadler Rail KISS EMU fact sheet. TJPA/PMPC will not make assumptions based on allowable capacity per SQFT.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.004	Section 2.3.1, Commuter Trains (First bullet)	LZ	07/04/22	It would be more appropriate to use crush loading capacity than only fully-seated passenger load. sentence needs rewording	9/1/2022	MM	A	This is true for Caltrain trains. Sentence to be reworded.				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC
TA.005	Section 2.3.1, Commuter Trains (Third bullet)	LZ	07/04/22	If one standee per 1.8 sq ft is used here, the same should be used on 2nd bullet above for propulsion	9/1/2022	MM	A	I have updated the definitions for AW1, AW2, and AW3 so that there is no confusion.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.006	Section 2.3.1, Commuter Trains (Third bullet)	LZ	07/04/22	States: "do not assume that regeneerative brakes will be used." I believe regenerative brakes are being provided for the EMUs. Please confirm	9/1/2022	MM	C	The Caltrain EMU will have regenerative braking capabilities but for the purpose of these calculations it is more conservative to assume no regenerative braking.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.007	Section 2.3.2, High-speed Trains (third para below Table 2-5)	LZ	07/04/22	The assumption of 15lbs of luggage for HSR passengers seems low, since many passengers will most likely be carying more that just a briefcase	8/31/2022	MJS	B	The assumed average weight of 15lbs of luggage per HSR passenger was coordinated with and approved by CHSRA.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.008	Section 2.3.3, Maintenance Equipment and Work Trains (First para)	LZ	07/04/22	States that diesel-powered locomotives wil be used for maintenace. Dual mode (electric/battery) -powered locomotives would be much cleaner. Even if diesel is preferred, locos should be dual mode (electric-diesel) so as to minimize diesel use	9/1/2022	MM	C	At this time, Caltrain has informed TJPA that they plan to continue use of their current maintenance equipment which is diesel. As noted, diesel is a less clean source so this is a conservative approach. If Caltrain changes position in the future, the design criteria can be updated.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 7
Comments Closed 7
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 03, Safety and Security*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Chukwuma Umolu (Design Team/Parsons)	CU	James Deane (CHSRA)	JRD
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Karen Saux (PMPC/Mott MacDonald)	KS

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C – Answer provided; no action needed
DE – Designer to evaluate

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ROK – response okay
BCC – Back-check comment

BRS - Back-check Response Status
CC - comment closed
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Chapter 3, Codes, Standards & Guidelines	CU	11/29/21	Add NFPA 130 and any other relevant NFP guidelines. Add California Building Code	05/09/22	KS	A	NFPA 130 and CBC added	08/05/22	ROK		08/05/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	08/05/22	CC
GEC.002	3.2 - Safety and Security Certification, ¶3-1	CU	11/29/21	Suggest identifying roles of FLS Committee relevant to all design phases.	05/16/22	MM	DE	Revised to read as follows: "The documentation will comprise a series of certificates attesting to conformance with safety and security requirements of the individual system elements, procedures, and training programs."	08/05/22	ROK		08/05/22	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	08/05/22	CC
HSR.001	3 - General	JRD	04/15/22	CH 3 should address Crime Prevention thru Environmental Design except as reference- what do you want them to do?	05/13/22	MM	C	TJPA's Threat and Vulnerability Assessment and associated project-specific criteria will address this item.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.002	3 - General	JRD	04/15/22	CH 3 should address ATPA safety and security guidelines and standards	05/13/22	MM	C	TJPA's Threat and Vulnerability Assessment and associated project-specific criteria will address this item.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.003	3 - General	JRD	04/15/22	CH 3 does not address anti-terror provisions	05/13/22	MM	C	TJPA's Threat and Vulnerability Assessment and associated project-specific criteria will address this item.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.004	3 - General	JRD	04/15/22	CH 3 consider accident prevention thru design processes	05/13/22	MM	C	TJPA's Threat and Vulnerability Assessment and associated project-specific criteria will address this item.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
TA.001	Chapter 3, System Safety and Security (Codes, Standards, and Guidelines, first sentence)	LZ	07/04/22	Add "will" before "guide"	9/1/2022	MJS	A	Revised as noted (will was added but there is no "Guided" in the sentence)				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 9
Comments Closed 9
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 04, Environmental Requirements*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Brad Pollock (Design Team/Parsons)	BP	Rebecca Wong (Design Team/Parsons)	RW
Peter Chou (Design Team/Parsons)	PC	S. Leidy (Design Team/Parsons)	SL
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS		

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Review Team				PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	4.5 - Floods, ¶1-1	CU	11/29/21	Reference, coordinate with language in Hydrology section of 05 Civil Design chapter	05/11/22	KS	A	Reference to Chapter 5, Civil Design, added.	08/05/22	ROK		08/05/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	08/05/22	CC
GEC.002	4.8.1 - Geotechnical Data, ¶1-1	RW	11/29/21	These documents are in the process of being updated. Referenced dates will need to be revised.	05/16/22	MM	A	References updated to current geotechnical reports.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.003	Section 4.1 Elevation, Page 4-1 of 3	CU	10/18/18	LEGACY Comment GEC18.031 - **4.1 Elevation** The ground surface elevation over the extent of the DTX alignment varies from a minimum of 10 feet to a maximum of 65 feet approximately based upon NAVD 88 (North American Vertical Datum of 1988). Top of rail elevation varies from 15 feet at grade with the Caltrain Yard to -33 feet 8 inches at the Transit Center. Delete	10/28/22	MJS	A	Deleted.	08/05/22	ROK		08/05/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	08/05/22	CC
GEC.004	DC 4.8.1	PC	10/18/18	LEGACY Comment GEC18.032 - We will have to update all references to geotechnical documents; perhaps not providing dates?	10/28/22	MJS	A	References updated to current geotechnical reports.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.005	DC 4.8.4	PC	10/18/18	LEGACY Comment GEC18.033 - Simply reference to geotechnical documents?	10/28/22	MJS	A	References updated to current geotechnical reports.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.006	General	SL	09/12/16	LEGACY Comment GEC16.001 - Did not review drainage/hydrology design criteria	10/28/22	MJS	C	Noted. The PMPC team has researched sea level rise and 100-year storm event - a technical memorandum has been issued to the design team reflecting findings.				05/16/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.007	Section 4.11, Noise and Vibration (first sentence)	RW	08/16/22	Section 4.11 references "Section 2.15 of the Final SEIS/EIR.." - this should be updated to "Section 2.12"	09/01/22	MJS	A	Revised as noted.				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
Cal.001	Chapter 4 Section 4.2; (Page 4-2 of 4)	PCG	06/17/22	Environmental Requirements: Be beneficial to have projected ambient temperatures within the tunnel and covered section of the track system - Helpful in determining the desired rail neutral temperature	09/01/22	MJS	C	The ambient temperature and humidity ranges for the tunnel will be determined through analysis/design work and will depend primarily upon the air flow modeling and ambient air exchange and mechanical damper system. It is not our intent to include this as a design criteria.				10/06/22	MJS	The responder (PMPC Team) has agreed to provide ambient/design temperature and humidity ranges within the tunnel and underground structures during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/06/22	CC
TA.001	Section 4.9, Atmospheric Pollution and Contamination (second para)	LZ	07/04/22	For clarity add "of the SEIS/EIR" after "D.2"	09/01/22	MJS	C	Sentence currently reads as follows (no change necessary): "Requirements for mitigating air quality impacts of the DTX are specified in Appendix D.2 of the Final SEIS/EIR."				09/27/22	MJS	The responder (PMPC Team) clarified that the DTX guideway geometrics (Chapter 7) and trackwork (Chapter 8) are governed by Caltrain Design Criteria.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 32
Comments Closed 32
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 05, Civil Design*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team)	AG	Chukwuma Umolu (Design Team)	CU
Q. Mehirdel (Design Team)	QM	S. Leidy (Design Team)	SL
Charles Felder (Design Team/CHS)	CF	Paul Hebditch (CHSRA)	PH
M. Brunner (CHSRA)	MBr	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Chapter 5, Codes and Standards, (new) Sixth bullet	AG	11/30/21	Edited to add: San Francisco Public Utilities Commission Design Guidelines & Standards CPUC General Orders	05/13/22	KS	A	Done				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	Chapter 5, Codes and Standards, Fourth bullet	AG	11/30/21	Revise to read as follows: "San Francisco Public Works (SFPW) Standard Specifications and Plans"	05/09/22	KS	A	Done				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	Chapter 5, Codes and Standards, (new) Last bullet	CU	11/30/21	Add "CPUC General Orders" and include those that apply	05/13/22	MJS	A	To be revised as noted.	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	5.2.1.1 - Geometric Design, ¶3-1	CU	11/29/21	Design of at-grade crossings per CPUC General Orders 36-D, 72-B, 75-B, 88-B and 135.	05/13/22	KS	A	Done	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	5.4.4 - Drainage Infrastructure, ¶1-2	CU	11/29/21	Edit to read: "SFPW Standard Plans and Specifications"	05/09/22	KS	A	Done	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	5.6.2 - Access, ¶2-1	AG	11/29/21	Edit to read: "Temporary interruptions to local access to businesses and residences must be coordinated and agreed ***upon*** with the respective owners."	05/09/22	AK	A	Revised to read: *Temporary interruptions to local access to businesses and residences must be coordinated and agreed to by the respective owners.*				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	Section 5.1.1, Page 5-2, (Table 5.1)	QM	09/12/16	LEGACY Comment GEC16.023 - Benchmark AB 7679: revise Northing to 37 42 22.15227, revise Easting to 122 23 36.90516 (per NGS online database)	10/28/21	AG	B	Agree, confirmed online.	11/18/21	ROK	11/18/21 WS per meeting with Chaudhary on 11/1/21 they recommend we continue to use Transit Center Horizontal Datum NAD83 (1991.35). The Northing and Eastings proposed revisions refer to NAD83 (2011). Ref: https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=AB7679				05/04/22	CC
GEC.008	Section 5.1.1, Page 5-2, (Table 5.1)	QM	09/12/16	LEGACY Comment GEC16.024 - Benchmark AB 7677: revise Northing to 37 44 00.33842, revise Easting to 122 29 49.03249 (per NGS online database)	10/28/21	AG	B	Agree, confirmed online.	11/18/21	ROK	11/18/21 WS per meeting with Chaudhary on 11/1/21 they recommend we continue to use Transit Center Horizontal Datum NAD83 (1991.35). The Northing and Eastings proposed revisions refer to NAD83 (2011). Ref: https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=AB7677				05/04/22	CC
GEC.009	Section 5.1.2, Page 5-2, (Table 5.2)	QM	09/12/16	LEGACY Comment GEC16.025 - Benchmark HT0685: revise Easting to 122 23 33 (per NGS online database)	10/28/21	AG	B	Agree, confirmed online.	11/18/21	ROK	11/18/21 WS per meeting with Chaudhary on 11/1/21 they recommend we continue to use Transit Center Horizontal Datum NAD83 (1991.35). The Northing and Eastings proposed revisions refer to NAD83 (2011). Ref: https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=HT0685				05/04/22	CC
GEC.010	Page 5-2, Section 5.1.2, (Table 5.2)	QM	09/12/16	LEGACY Comment GEC16.026 - Benchmark HT0685: revise Northing to 37 47 39 (per NGS online database)	10/28/21	AG	C	Northing in Design Criteria already correct: 37 47 39.		ROK					05/04/22	CC
GEC.011	Section 5.2.1.1, Page 5-3, Line 5	QM	09/12/16	LEGACY Comment GEC16.027 - "… all AASHTO standard bus vehicles" is too general, further direction needed on specific bus type that shall be accommodated (i.e., City Transit, Intercity, Articulated, etc.)	10/28/21	AK	A	Included text that clarifies which AASHTO design vehicles we are designing to: "…SU-30, WB-40, and BUS-40"	11/18/21	ROK	Text added	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.012	Section 5.6, Page 5-7, Line 3	QM	09/12/16	LEGACY Comment GEC16.028 - Add the following after "Traffic Control Devices," : "California Highway Design Manual, Caltrans Traffic Manual,"	10/28/21	AG	A	Added.	11/18/21	ROK	"California Temporary Traffic Control Handbook (CATTCH), Caltrans Highway Design Manual (HDM)" added	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.013	Section 5.2.1.2, Page 5-3, Paragraph 2	SL	09/12/16	LEGACY Comment GEC16.029 - "If vertical clearance is limited between road surface and top of utilities (less than 3 feet), provision will be made for armoring the utility and/or backfilling with a lean concrete mix or controlled density fill material." For the 3' clearance, what standard is this referencing? Also, different utility companies might have different clearance standards, should also include statement that should follow specific utility requirements as well. Is project on City streets only? If project is on Caltrans right-of-way, they might require a concrete cap with a slurry backfill for utilities. If a lean concrete mix or controlled density fill is needed, which applicable standard/spec will be followed?	10/28/21	MJS		Removed "(less than 3 feet)" from section. Will include reference to Chapter 6 - Utilities for specific utility criteria references.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.014	Section 5.1 Survey Control, Page 5-2 of 8	CU	10/01/18	LEGACY Comment GEC18.034 - Update to incorporate any new control points established Phase One.	10/28/21	AK	C	Verified horizontal control points in previous Project Survey Control document from Chaudhary in 2010. No new control points.	8/5/2022	ROK					05/04/22	CC
GEC.015	Section 5.6	CF	10/01/18	LEGACY Comment GEC18A.002 - The intro paragraph sites a Maintenance and Protection of Traffic Plan. Please clarify whether this is meant to be a stand-in term for what will be Traffic Management Plan (within the context of the design criteria).	10/28/21	AK	A	Yes, this will be the Traffic Management Plan (TMP). References to a "MPT Plan" have been changed to refer to the future TMP instead.		ROK	Wording revised	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.016	Section 5.6	CF	10/01/18	LEGACY Comment GEC18A.003 - The AASHTO Policy on Geometric Design of Highways and Streets, as well as the Caltrans Manual of Uniform Traffic Control Devices, are for a Traffic Control Plan, and would not be appropriate for a Traffic Management Plan.	10/28/21	AK	A	Wording has been revised to include a Temporary Traffic Control (TTC) Plan as part of the TMP.		ROK	Wording revised	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.017	5.6.1	CF	10/01/18	LEGACY Comment GEC18A.004 - Paragraph 3 states that "Road closures may be required…" Note that detours may also be required, and the road closures would occur on weekday nights and weekends only.	10/28/21	AG	A	Revised text to read: "Road closures and detours may be required…" Added last sentence to paragraph 3: "Road closures shall only occur on weekday nights and weekends."		ROK	Wording revised	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.018	5.6.1	CF	10/01/18	LEGACY Comment GEC18A.005 - No reference is made to potential transit delay (for example, the Central Subway will be running along the center of 4th Street between Bryant Street and Townsend Street).	10/28/21	AK	A	Added paragraph: "Transit routes in the area may also be affected by construction activities. Detours may be provided for transit routes that run on the surface streets above the DTX alignment, which may also cause potential transit delays during construction. Proper protection or decommissioning procedures of the OCS for Muni may be needed, which shall be provided by others."		ROK	Wording revised	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.019	5.6.2	CF	10/01/18	LEGACY Comment GEC18A.006 - The coordination with business and residence access would be for a Traffic Control Plan. CHS's Traffic Management Plan will focus on analysis, and will not include local business/resident outreach.	10/28/21	AK		Will coordinate with TJPA and discuss the logistics of the Traffic Management Plan.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.020	5.6.3	CF	10/01/18	LEGACY Comment GEC18A.007 - This section is appropriate for a Traffic Control Plan, not for a Traffic Management Plan.	10/28/21	AK	A	Wording has been revised to include a Temporary Traffic Control (TTC) Plan as part of the TMP.		ROK	Wording revised	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.021	5.6.4	CF	10/01/18	LEGACY Comment GEC18A.008 - This section references DPT, but the appropriate agency would be SFMTA.	10/28/21	AG	A	Revised.		ROK	Reference to SFMTA/DPT has been removed	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 32
Comments Closed 32
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 05, Civil Design*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team)	AG	Chukwuma Umolu (Design Team)	CU
Q. Mehirdel (Design Team)	QM	S. Leidy (Design Team)	SL
Charles Felder (Design Team/CHS)	CF	Paul Hebditch (CHSRA)	PH
M. Brunner (CHSRA)	MBr	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.022	5.6.4	CF	10/01/18	LEGACY Comment GEC18A.009 - Drawings are appropriate for a Traffic Control Plan, not for a Traffic Management Plan.	10/28/21	AK	A	Wording has been revised to include a Temporary Traffic Control (TTC) Plan as part of the TMP.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.023	5.6.5	CF	10/01/18	LEGACY Comment GEC18A.010 - This section is appropriate for a Traffic Control Plan, not for a Traffic Management Plan.	10/28/21	AK	A	Wording has been revised to include a Temporary Traffic Control (TTC) Plan as part of the TMP.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.024	5-1 Codes and Standards	CU/SM	07/05/22	For the sub-bullets for "California Public Utilities Commission General Orders": Fix capitalization and correct title of 72-B RULES GOVERNING THE CONSTRUCTION AND MAINTENANCE OF CROSSING AT GRADE OF RAILROADS WITH PUBLIC STREETS, ROADS AND HIGHWAYS IN THE STATE OF CALIFORNIA	09/01/22	MJS	A	All references (and list of references) have been checked				11/10/22	KS	Occurences of this standard are consistent	11/10/22	CC
GEC.025	5.5.1 General Requirements	CU	07/04/22	References to "SFPW" are not accurate - it is the "San Francisco Department of Public Works"	11/10/22	KS	A	Revised				11/10/22	KS		11/10/22	CC
GEC.026	5.5.2.1	HK/BP	08/04/22	Remove 12" freeboard requirement per June 2022 coordination	09/01/22	MJS	A	Agree. Will update text to match PMPC flooding and sea level rise memorandum.				11/10/22	KS	Memorandum refernced in Section 4	11/10/22	CC

Transbay Program
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Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 05, Civil Design*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team)	AG	Chukwuma Umolu (Design Team)	CU
Q. Mehirdel (Design Team)	QM	S. Leidy (Design Team)	SL
Charles Felder (Design Team/CHS)	CF	Paul Hebditch (CHSRA)	PH
M. Brunner (CHSRA)	MBr	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.001	Section 5.4, 5-4	PH	10/01/18	LEGACY Comment HSR18.015 - Permanent fencing should protect the employees of CHSR and TJPA as well as Caltrain.	10/28/21	AG	A	Revised text to read: "…and employees of Caltrain, CHSRA, and TJPA shall…"		ROK					05/04/22	CC
HSR.002	Section 5.4.1, 5-4	MBr	10/01/18	LEGACY Comment HSR18.032 - 5.4.1 Fencing Details - Fencing shall restrict thrown projectiles from impacting / hitting the sides and windshields of the trainsets and eliminate vandalism and graffiti from occurring during and after construction. Please add note to this effect, to conform with FRA safety criteria.	10/28/21	AG	A	Added note as last paragraph in Section 5.4.		ROK					05/04/22	CC
HSR.003	Section 5.5.3.3, 5-6	MBr	10/01/18	LEGACY Comment HSR18.033 - 5.5.3.3 Velocity and Freeboard - trainsets are prohibited from operating if water is over 2 inches above top of rail and at restrictive speeds.	10/28/21	AG	A	Added note as last paragraph in Section 5.5.3.3.		ROK					05/04/22	CC
Cal.001	Chapter 5 Section 5.5.3.3 (Page 5-7 of 9)	JP	06/30/22	5th bullet: omit return at end of paragraph	09/01/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.001	Chapter 5, Civil Design (Codes and Standards (third bullet)	LZ	07/04/22	In addition of the Blue Book it should also comply with the SFMTA Rail Standards in the areas of interface with Central Subway	09/01/22	MJS	A	Editorial: (Karen) we need to ensure all references (and list of references) are updated to match accordingly				11/10/22	KS	Comment addressed	11/10/22	CC
TA.002	Section 5.6.1, General Requirements (Fourth para)	LZ	07/04/22	Talks about decommissioning of MTA's OCS. Make it clear that this will only happen when single tracking, since MTA is not amenable to bus bridges	09/01/22	MJS	C	Decommissioning of Muni OCS will be permanent as the trolley lines cannot cross or come within close proximity to the DTX OCS (Muni is a DC system, DTX will be AC power). The decommissioned trolley OCS supports elecrified busses and therefore capable of bridging non-energized sections such as the proposed gap.				09/27/22	MJS	The responder (PMPC Team) clarified original commentor's confusion; this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
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Total Comments 6
Comments Closed 6
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 06, Utilities*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Rick Bartholomew (Caltrain)	RB	Rick Bartholomew (Caltrain)	RB
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Will Spargur (PMPC/HCI)	WS	John Updike (PMPC)	JU

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	General	MJS	11/11/21	LEGACY Comment PMPC.001 - The minimum required clearance between pavement and top of utility is likely owner-specific based on utility (electrical, gas, water, etc.). The appropriate owner-specific criterion references/resources should be identified in chapter 6.	02/28/22	MM	C	Add clause in Section 6.6 that states the minimum required clearance between pavement and top of utility is owner-specific based on the utility. (see comment in document)	04/06/22	PAR	The beginning of the chapter instructs the designer to follow guidelines of utility owner and in the absence of those follow industry standards, federal, state and local codes, standards and guidelines.	05/11/22	KS	I added the clause to section 6.6. The table lists utility-specific codes/standards, so it does not appear to conflict with the beginning of the chapter.	05/13/22	CC
Cal.001	Section 6.2	RB	10/18/18	LEGACY Comment Cal18.007 - Underground utilities should be identified to determine impact to project and a decision made to relocate or replace prior to project award.	02/28/22	MJS	A	On-going surveys are being undertaken to identify all existing underground utilities - relocation plans will need to be closely coordinated with each utility owner.				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.002	Section 6.6.7	RB	10/18/18	LEGACY Comment Cal18.008 - Section 6.6.7 Telecommunications PCJPB FOC (fiber optic cable)	02/28/22	MJS	A	Section 6.6.7 Telecommunications will be updated to include PCJPB Fiber Optic Cable (backbone)				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.003	(Page 6-3 of 3); 6.7	JP	06/30/22	last sentence, omit space after Chapter 11 ,	09/01/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.001	Section 6.1, Design and Design Responsibility (Fourth para)	LZ	07/04/22	Add "the designer must" between "indicated" and "complete" in first sentence	09/01/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.002	Section 6.7, Basement Vaults of Adjacent Buildings (First para)	LZ	07/04/22	Should state that demolition and reconstruction of basement vaults in the public right-of-way will be at the property owner's expense	09/13/22	JU	A	Added the following: ".. demolition of unpermitted vaults/basements within the public ROW will be at the property owner's expense"				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 123
Comments Closed 123
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 07, Guideway Geometrics*		
Document date:	*2/28/2022*		

Reviewers

Name	Initials	Name	Initials
Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
Keith Abey (Design Team)	KA	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Hok Lai (Caltrain)	HL
Pedro C Gutierrez (Caltrain)	PCG	Joel Pancoast (Caltrain)	JP
Bin Zhang (Caltrain)	ZB	Luis Zurinaga (SF CTA)	LZ
X. Banko (CHSRA)	XB	M. Brunner (CHSRA)	MBr
James Deane (CHSRA)	JD	Douglas McCloud (CHSRA)	DMcL
Philip Gilmour (CHSRA)	PGi	Eric A. Scotson (CHSRA)	EAS
	Responders		
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Chapter 07 - Guideway Geometrics	SM	03/17/22	See tracked changes and review comments in "Chapter 07_Guideway Geometrics_comments.pdf"	04/28/22	MJS	C	Incorporated into this CRL - See Comments #GEC.002 - GEC.024	08/05/22	BCC	Equation 7.4 has not been corrected.	09/01/22	MJS	Equation 7.4 (now 7.3) has been updated per comment.	09/27/22	CC
GEC.002	7.1.2, Eqn 7.1 Variable "Eu"	FB	03/18/22	Revise to read as "Eu is the maximum unbalanced superelevation, in inches."	05/09/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.003	7.1.3 - Maximum Speeds through Turnouts, bullet points	FB/CU	03/18/22	Refer to Caltrain Standards, Chapter 2 - Track, Part B Special Trackwork, Section 2.1 Speeds Through Turnouts and Crossovers	05/10/22	MJS	A	Refer to Caltrain Design Criteria, Chapter 2 - Track, Part D - Special Trackwork, Section 2.1 Speeds Through Turnouts and Crossovers. PMPC Team verified the correct reference.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.004	7.2.1 - Horizontal Alignment, ¶1-2	FB	03/18/22	Unless I missed something the only requirement to omit is if Ea1 = Ea2.	05/10/22	MJS	A	Updated subsection 7.2.3 - Spiral Curves (referenced in 7.2.1) to read as follows: "Spiral curves must be clothoids and conform to Caltrain Design Criteria Chapter 2 - Track, Part C – Track Geometry, Section 5.0 – Spirals."	08/05/22	BCC	There is nothing in the update that indicated elimination of spirals, but rather Ls (min) = 100'.	09/01/22	MJS	The first paragraph of section 7.2.3, Spiral Curves includes a statement that spirals (and the applications thereof) must conform to Caltrain design criteria (this includes the condition(s) where spirals are not necessary). No change required. The first sentence of the second paragraph "Sprial curves must have a minimum length." has been removed.	09/27/22	CC
GEC.005	7.2.1.1 Minimum Tangent Length, ¶3-1	CU	03/18/22	In reference to "absolute minimum tangent length .. 100 feet" - Not practical in this project, expect DVRs.	05/10/22	MJS	B	Caltrain criteria govern per agreement between Operators/TJPA.	8/5/2022	ROK	Design team will work with TJPA/PMPC to identify required DVRs for submission to Caltrain.				8/5/2022	CC
GEC.006	7.2.1.2 - Tangent Track Spacing	CU	03/18/22	Consolidate track spacing requirements scattered here, 7.2.5 and 7.2.7.4 into one section	05/10/22	MJS	A	Sections consolidated	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.007	7.2.1.2 - Tangent Track Spacing, Table 7-1. Minimum Tangent Track Spacing	CU	03/18/22	Regarding "Mainline track to mainline track desirable value of 16'-6" "- There is no benefit in this track spacing increase as it is not practical in this project	05/10/22	MJS	A	Revised table to show desirable track spacing of 15 ft 0 in.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.008	7.2.2 - Horizontal Curves	FB	03/18/22	In reference to : "(chord definition) may also be shown on the plans. Distances must be measured along curve arcs." - Odd Combination	05/10/22	MJS	A	Revised to read as follows: "Horizontal curves must conform with the Caltrain Design Criteria, Chapter 2 – Track, Part C – Track Geometry, subsection 3.3 – Horizontal Curves unless otherwise stipulated in this chapter."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.009	7.2.2.1 - Minimum Length of Circular Curves, ¶2-1	CU	03/18/22	In reference to "absolute minimum tangent length .. 100 feet" - Not practical in this project, expect DVRs.	05/10/22	MJS	B	Caltrain criteria govern per agreement between Operators/TJPA.	8/5/2022	ROK	Design team will work with TJPA/PMPC to identify required DVRs for submission to Caltrain.				8/5/2022	CC
GEC.010	7.2.2.2 - Minimum Radius of Curvature, Eqn #?	SM/FB	03/18/22	R = (4V^2)/e (square velocity), most agencies use (4.011V^2)/e Also note that the Eqn identifier number is missing "(7.3)"	05/10/22	MJS	B	Caltrain's Design Criteria does provide a formula for calculating a desirable minimum radius of curvature, nor does it provide an absolute minimum radius. The formula provided in the DTX Design Criteria (now 7.4) where R=(4V^2)e matches CHSRA Design Criteria Manual, Chapter 24 -Trackway Geometry (24.2.6.1 Horizontal Curves).	08/05/22	BCC	Numbering of the equations should be sequential. Numbers currently used are 7.1, 7.2, 7.4, 7.9, and 7.10. (duplicated) 7.11, 7.12, 7.14, 7.16, 7.17, and 7.18. Revise equation to show square of velocity ("V^2")	09/01/22	MJS	Editorial: Numbering/sequencing of the equations need to be updated/revised. For Chapter 7 - SL	09/27/22	CC
GEC.011	7.2.3 - Spiral Curves, Table 7-2	FB	03/18/22	The preferred and minimum equations for Minimum Segment are identical	05/10/22	MJS	A	The formulas were updated to match Caltrain's Design Criteria, Table 2-5: Length of Spiral. The formula for preferred and minimum length of spiral in twist design factor are identical. The minimum formula has been updated for Minimum Segment to Ls = 2.20V.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.012	7.2.2.2 - Minimum Radius of Curvature, ¶4-2	FB	03/18/22	Revise to read as: "Round calculated lengths of spiral curves up to the nearest 5 feet." NOTE: This will not work if designing concentric curves	05/10/22	MJS	A	Revised as noted	08/05/22	BCC	The rounding requirement seems to have been deleted.	09/01/22	MJS	The TJPA/PMPC team removed this requirement to be left to the designer's preference.	09/27/22	CC
GEC.013	7.2.2.2 - Minimum Radius of Curvature, ¶5-1	CU	03/18/22	In reference to "absolute minimum tangent length .. 100 feet" - Not practical in this project, expect DVRs.	05/10/22	MJS	B	Caltrain criteria govern per agreement between Operators/TJPA.	8/5/2022	ROK	Design team will work with TJPA/PMPC to identify required DVRs for submission to Caltrain.				8/5/2022	CC
GEC.014	7.2.6 - Track Spacing on Curves,	CU	03/18/22	Text in this section applies to tangent and curves, see comment #GEC.006	05/10/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.015	7.2.6 - Track Spacing on Curves, ¶5-1	CU	03/18/22	Delete first sentence.	05/11/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.016	7.2.7.2 - Maximum Superelevation, ¶5-1	CU	03/18/22	In reference to" ".. Range of operating speeds to ensure that the maximum allowable value for negative unbalance is not exceeded." - May not be well defined at 30%	05/11/22	MJS	C	Noted, no update necessary at this time	8/5/2022	ROK	Design team will identify changes to the design criteria that are recommended as the design level progresses.				8/5/2022	CC
GEC.017	7.2.7.4 - Track Spacing on Superelevated Curves	CU	03/18/22	See prior comment (comment # GEC.006) to consolidate track spacing requirements	05/10/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.018	7.2.10 - Turnouts, Table 7-5. Minimum Tangent Lengths at Turnouts	SM	03/18/22	Replace "note" with "not" in three of the five rows under "Absolute Value"	05/09/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.019	7.3 - Clearances	SM	03/18/22	Need to list special clearance situations such as platform edges, and walkways (emergency and maintenance) surfaces. Need required heights and offsets.	05/09/22	MJS	C	Clearances for platform edges and walkways are provided in the Minimum Horizontal Clearance table in this section.	8/5/2022	ROK					8/5/2022	CC
GEC.020	7.3.1 - Definition of Clearance Envelopes, ¶3-1	SM	03/18/22	Does this duplicate clearances accounted for in the calculation of the VDE, 1" cross-level variation?	05/09/22	MJS	A	Updated section 7.3.1 to directly parallel Caltrain's criteria Section 3.1: "On curves, to provide clearance between cars and locomotives equivalent to that obtained on adjacent tangent track, track centers shall be increased as follows: a. A minimum of 1 inch for every 30 minutes of curvature where the amount of superelevation is the same on adjacent tracks or the superelevation of the inner track is greater than that of the outer track b. A minimum of 1 inch for every 30 minutes of curvature, plus 3½ inches for every inch of difference in elevation between the two tracks where the superelevation of the outer track is greater than that of the inner track	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) will has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	8/5/2022	CC
GEC.021	7.3.4 - Adjustments to Clearances for Horizontal Curvature and Superelevation, Eqn #7.10	FB	03/18/22	Replace "Ee" with "Ea", update formula and variable list accordingly	05/09/22	MJS	A	Revised as noted (note that this has been updated to eqn # 7.18)	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.022	7.3.6 - Minimum Horizontal and Vertical Clearances, Table 7-9. Minimum Horizontal Clerance	CU	03/18/22	Update horizontal clearances for both operators on first two lines to 8' - 7" (from 9' - 3")	04/25/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.023	7.3.6 - Minimum Horizontal and Vertical Clearances, Table 7-9. Minimum Horizontal Clerance	CU	03/18/22	"Clearance to high-level walkway (more than 8" above top of rail)" - Does not apply per latest guidance	04/25/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC

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James Deane (CHSRA)	JD	Douglas McCloud (CHSRA)	DMcL
Philip Gilmour (CHSRA)	PGi	Eric A. Scotson (CHSRA)	EAS
	Responders		
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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GEC.024	7.3.6 - Minimum Horizontal and Vertical Clearances, Table 7-9. Minimum Horizontal Clearance	CU	03/18/22	Revise Caltrain clearance to Track centerline to edge of level platform to 5'-8"	04/25/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.025	Section 7, Codes, Standards and Guidelines, Page 7-1 of 13	CU	10/01/18	LEGACY Comment GEC18.035 - Update for latest AREMA, CHSRA and Caltrain standards.	02/28/22	AG	A	Removed years/dates to be consistent with remaining design criteria chapters.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.026	Section 7.2.4 Reverse Curves	CU	10/01/18	LEGACY Comment GEC18.036 - 7.2.4 Reverse Curves The use of reverse curves shall generally be avoided. However, where the use of reverse curves is unavoidable, a minimum tangent distance of 100 feet shall be provided between reverses. Requirements for spiral transitions and superelevation shall be in accordance with this chapter. Expect deviation request at 4th & Townsend to allow back-to-back spirals.	02/28/22	MJS	A	Added text: "..is unavoidable, a preferred minimum tangent length between reverse curves must conform with section 7.2.8.3. The use of reverse curves shall be submitted to TJPA as a deviation request for review and approval."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.027	7.3 Clearances, Page 7-8 of 13	CU	10/01/18	LEGACY Comment GEC18.037 - Update to incorporate latest Caltrain and CHSRA rolling-stock static and dynamic outlines.	02/28/22	MJS	A	Section 7.3 will be revised following operator approval of the draft composite vehicle clearance envelope(s).	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.028	Table 7.11	KA	10/01/18	LEGACY Comment GEC18.038 - Horizontal and vertical distances do not adequately describe the stop sign shaped clearance envelope we've been using	02/28/22	MJS	A	Agreed, will negotiate option to replace with figure expressing vertical and horizontal clearances	8/5/2022	ROK	Will review future revision for consistency.	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.029	7.3.6.1 Table 7.11	DF	10/01/18	LEGACY Comment GEC18.039 - Track Centerline to edge of platform for Caltrain (5'-7") and CHSRA (5'-9") are NOT the same. Will this create 'conflicts' with the current 3-platform face station configuration for CHSRA trains passing through Fourth & Townsend Station platforms if designed for Caltrain service only?	02/28/22	AG	B	Correction: Caltrain = 5'-4". Design should consider more restrictive of both Caltrain and CHSRA. If platforms are designated for each operator, both requirements should be listed.	8/5/2022	ROK	Caltrain to Track CL is now 5'-8"; CHSR to Track CL is now 6'-0"				8/5/2022	CC
GEC.030	7.2.1 Horizontal Alignment	SM	06/14/22	(Second sentence in first Paragraph) Since there are no conditions described in 7.2.3 consider omitting sentence since they are described in referenced Caltrain criteria.	09/01/22	MJS	A	Sentence removed from section 7.2.1. Section 7.2.3 refers to Caltrain DCM which states "Spirals are not required for curves less than 30 minutes for MAS under 20mph, or on curve that is part of a turnout; however, a minimum curve length of 100 feet shall be implemented. Additionally, all curves, including such curves, shall have a minimum 1/2 inch actual superelevation."				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
GEC.031	7.2.1.1 Minimum Tangent Length	CU	07/01/22	(Second sentence after Eqn 7.2) Reconcile with bumper language	09/01/22	MJS	A	Revised as noted				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
GEC.032	7.2.2.2 Minimum Radius of Curvature	SM	06/14/22	Correct formula: R=(4V^2)/e (formula not numbered)	09/01/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
GEC.033	7.2.8.5 Combined Horizontal and Vertical Curvature	CU	07/07/22	Eliminate legacy criteria. It is impossible to avoid major overlaps on this project due to right-of-way constraints and Caltrain criteria has no restriction	09/01/22	MJS	DE	DTX DCM states "Avoid overlapping.." - it does not prohibit. Caltrain criteria governs. Will add "where feasible".				10/10/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/10/22	CC
GEC.034	7.3.5.1 to 7.3.6 (Table 7.8 to 7.11 references	HK	08/03/22	Table references for Table 7.8 to 7.11 are incorrectly noted in the body of the text from sections 7.3.5.1 to 7.3.6.	09/01/22	KS	A	Editorial: Please ensure formulas, table #, figure #, and references are updated. Updated noted table issues AND **added table 7.9 to TOC.**				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
GEC.035	7.3.6 Minimum Horizontal and Vertical Clearances	CU	07/12/22	Restore "Table 7-9: Minimum Horizontal Clearance" (line item "Track centerline to face of tunnel station wall (conditions where no walkway exists") to account for legacy condition at Transit Center where there is no provision for side walkways opposite Caltrain platforms	09/01/22	MJS	A	Returned line item to table though the old clearnace for the existing STC design/condition still states 7'-3"				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
GEC.036	7.3.6 Minimum Horizontal and Vertical Clearances	CU	07/12/22	Restore missing footnote: "*Dimensions for infrastructure assest must be verified against CPUC GO-26-D clearances."	09/01/22	MJS	A	Revised as noted, added following footnote: "Clearance dimensions for infrastructure assets must be verified against CPUC GO-26D clearances once CHSRA rolling stock is identified.				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC

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Cal.001	Chapter 7 Section 7.1.1	PCG	03/21/22	Specify limits and speeds - Currently between MP 0.47 and MP 1.13 the speeds vary between 35 and 40 MPH	05/10/22	MJS	A	The final track design will ultimately dictate maximum authorized speeds (MAS) along the alignment. Currently, at the preliminary engineering level, the stationing at which MAS is reduced is subject to change. The next iteration of the DTX Design Criteria may include a table with stationing limits of speed restrictions (5 mph increments). The section has been modified to read as follows: "The maximum authorized speed for passenger trains within the limits of the project, at-grade and below-grade tracks varies between 20 mph and 40 mph. The maximum authorized speed for trains approaching the Fourth and King Street Station between Caltrain mileposts 0.2 and 0.7 currently varies between 20 mph and 40 mph."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.002	Chapter 7 Section 7.1.1	PCG	03/21/22	The authorized train speeds between 4th and King MP 0.2 and MP 0.7 vary between 20 and 40 MPH	05/10/22	MJS	A	See response to comment Cal.001	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.003	Chapter 7 Section 7.1.3	PCG	03/21/22	Remove No. 11 and No. 15 turnouts, they are not Caltrain standard turnouts	05/10/22	MJS	A	Revised section 7.1.3 to read as follows: "The design speeds for passenger trains through turnouts are based on tangent point geometry and a maximum unbalanced superelevation of 3 inches. Refer to the Caltrain Design Criteria, Chapter 2 – Track – Track, Part D – Special Trackwork for maximum operating speed through turnouts."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.004	Chapter 7 Section 7.2.1	PCG	03/21/22	change/remove strikeout to reference section 7.2.3 Spiral curves	05/10/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.005	Chapter 7 Section 7.2.1.2	PCG	03/21/22	In table 7-1, we are saying that absolute value is 14 ft 6 in. , and in the sentence below we have 15' as the minimum	05/10/22	MJS	A	Removed sentence below Table 7-1	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.006	Chapter 7 Section 7.2.7	PCG	03/21/22	Will there be any station platforms on curves? If so there may be a need to superelevate track if the degree of curve is greater than 3 degree, other consideration will be passenger car tilt and clearance to the platform	05/10/22	MJS	C	No, the tracks at the Fourth and Townsend Street Station and Salesforce Transit Center will be tangent with the exception of track T-26 in the transit center, however, that platform face will be tapered.	05/13/22	ROK					05/13/22	CC
Cal.007	Chapter 7 Section 7.2.7.1	PCG	03/21/22	we are specifying a minimum of 0.5" superelevation for any curve, contradicts previous specification 7.2.7 requirement on station platforms (if any will be within a platform)	05/10/22	MJS	C	Section 7.2.7.1 is a subsection to 7.2.7, therefore the statement in 7.2.7.1 "For any curve, a minimum of 0.5 of superelevation must be specified." applies to all other conditions not listed in 7.2.7. Also, 1/2" for any curve is the language used in Caltrain Design Criteria 2.C.4.2.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.008	Chapter 7 Section 7.2.7.2	PCG	03/21/22	Table 7-3. Question as to why we are specifying 2 in Eu as the desirable Value and not 3 in Eu?	05/10/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.009	Chapter 7 Section 7.2.7.2	PCG	03/21/22	Second to last paragraph - Spiral and Geometric exception for curves in platforms - see previous comments on curves within station platforms	05/10/22	MJS	A	Sentence removed/deleted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.010	Chapter 7 Section 7.2.7.4	PCG	03/21/22	Remove this section or refer to section 7.2.6	05/10/22	MJS	A	Sections 7.2.6 and 7.2.7.4 will be moved as subsection to "7.2.1.2 Track Spacing" 7.2.1.2.1 Track Spacing – Tangent Track (currently 7.2.1.2) 7.2.1.2.2 Track Spacing on Curves (currently 7.2.6) 7.2.1.2.3 Track Spacing on Superelevated Curves (currently 7.2.7.4)	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.011	Chapter 7 Section 7.2.9.4	PCG	03/21/22	Are we not contradicting section 7.2.5?	05/10/22	MJS	C	No, section 7.2.5 allows for horizontal compound circular curves whereas section 7.2.9.4 is referring to compound vertical curves (not allowed).				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.012	Chapter 7 Section 7.2.10	PCG	03/21/22	second paragraph - change Table 7.54 to Table 7.45 or whatever table number will be used since Table 7.45 is striked out	05/10/22	MJS	A	Revised, update table name is Table 7-5	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.013	Chapter 7 Section 7.2.10	PCG	03/21/22	Table 7.45 - "Between point of switch of turnout" we have an Absolute value of "20' (tangent length will not be less than the length of the stock rail projection)" - here it is 20' below we are saying the length of the stock rail projection is 15'. Need to be consistent with what is the length of the stock rail projection?	05/10/22	MJS	B	This data is copied directly from Caltrain Design Criteria (Third Edition), Chapter 2 Track, Part C - Track Geometry, subsection 3.3 - Tangent; Table 2-2: Minimum Tangent Length (Main Tracks).				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.014	Chapter 7 Section 7.2.10	PCG	03/21/22	Table 7.45 - In a couple of items we are also referencing the length of the stock rail projection, but we change the distance to 15', what is the stock rail projection distance or specify a consistent distance for all	05/10/22	MJS	B	See response to comment Cal.013				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.015	Chapter 7 Section 7.3.5.1	PCG	03/21/22	Table 7-8 - Change tolerances to +- 0.125 for Ballasted and Direct Fixation track	05/10/22	MJS	DE	PMPC has evaluated and discussed internally, we do not believe that 1/8" is feasible for this type of construction work.				05/16/22	MM	The responder (PMPC Team) has confirmed that the criteria is correct as stated; no Caltrain criteria is available for this item; therefore this comment is considered closed.	05/16/22	CC
Cal.016	Section 7.2.1	HL	10/18/18	LEGACY Comment Cal18.009 - "..the conditions described in Section 7.2.3 are met." Spiral curves should always be used when there are actual superelevation.	02/28/22	MJS	A	Section 7.2.3 states: "Spiral, easement, or transition curves will be used between horizontal tangents and circular curves and between compound curves. Spiral curves will be clothoids. Spiral curves will be required wherever there is a change in actual superelevation and are desirable even when there is no actual superelevation."				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.017	Section 7.2.3	HL	10/18/18	LEGACY Comment Cal18.010 - Equation (7.4) under section 7.2.3 Spiral Curves which describes the desirable minimum length of a spiral curve: Please justify and provide reference for this criteria	02/28/22	MJS	A	Replaced formulas with table Caltrain Design Criteria (third edition, dated August 31, 2020), Chapter 2 - Track, Table 2-5: Length of Spiral				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 123
Comments Closed 123
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Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 07, Guideway Geometrics*		
Document date:	*2/28/2022*		

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Cal.018	Section 7.2.3	HL	10/18/18	LEGACY Comment Cal18.011 - (Clouded text) "Spiral curves are not required where the minimum calculated length of the spiral curve derived from equations 7.4 and 7.5 divided by the radius of curvature is less than 0.01." Please justify and provide reference for this criteria	02/28/22	MJS	A	Replaced formulas with table Caltrain Design Criteria (third edition, dated August 31, 2020), Chapter 2 - Track, Table 2-5: Length of Spiral				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.019	Section 7.2.4	HL	10/18/18	LEGACY Comment Cal18.012 - "..a minimum tangent distance of 100 feet shall.." The minimum tangent distance should be the greater of 3V or 100 feet	02/28/22	MJS	A	Revised to read as follows: "The use of reverse curves will generally be avoided. However, where the use of reverse curves is unavoidable, the minimum tangent length between reverse curves must conform with section 7.2.8.3."				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.020	Section 7.2.7	HL	10/18/18	LEGACY Comment Cal18.013 - (Clouded text) "Superelevation shall be varied uniformly along the length of the spiral curve. Where the condition for no spirals is met, the superelevation transition shall be developed over the calculated length of spiral, equally on either side of the point of curvature." Spiral curves should always be used when there are actual superelevation.	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-16 & Figure 2-2]: "Spirals are not required for curves less than 30 minutes for MAS under 20 mph, or on curve that is part of a turnout; however, a minimum curve length of 100 feet shall be implemented. Additionally, all curves, including such curves, shall have a minimum 1/2" actual superelevation.." Removed second sentence				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.021	Section 7.2.7.2	HL	10/18/18	LEGACY Comment Cal18.014 - (Clouded text) "Superelevation shall be checked against the range of operating speeds to ensure that the maximum allowable negative unbalance is not exceeded." Negative unbalance should be avoided as much as possible.	02/28/22	MJS	B	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-18 & Table 2-5]: Table 2-5 dictates minimum unbalance as Ls=1.22EuV Section 7.2.7.3 Minimum Superelevation states "the minimum unbalanced superelevation will be 1.0 inch, except for when the actual superelevation plus the unbalanced superelevation is less than 2.0 inches."				05/10/22	MJS	PMPC misinterpreted original comment. Table 7-3 revised (third row of data deleted "minimum negative unbalance for slowest operating train"). New sentence added: "Negative unbalance will be avoided."	05/10/22	CC
Cal.022	Section 7.2.9.2	HL	10/18/18	LEGACY Comment Cal18.015 - "The minimum radius of vertical curve shall be 2,000 feet." Include formula to determine the radius for checking	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Section 7.2 VERTICAL CURVES, pps 2-20, 2-21, Figure 2-3]: "Vertical curves shall be designed in accordance with the requirements for high-speed main tracks and shooflies, as recommended in AREMA Manual for Railway engineering shown in the following formula:." There is no formula from Caltrain's design criteria to solve for radius, the section was updated to conform with Caltrain.				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.023	Section 7.3.1.2 Table 7.6	HL	10/18/18	LEGACY Comment Cal18.016 - Table 7.6, Vehicle Dynamic Outline - Car Body Movements (line items 2-4) The assumed track deviations are low. Please refer to FRA part 213 for their limits based on appropriate class of track.	02/28/22	MJS	DE	FRA Part 213.307 - Classes of track: Operating speed limits defines Class 6 track as maximum allowable speed 110mph. Class 6 track prescribes the following maximum values for deviations/variations: Track cross level deviation: Gauge variation: Alignment deviation:				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.024	Section 7.3.1.2 Table 7.6	HL	10/18/18	LEGACY Comment Cal18.017 - Table 7.6, Vehicle Dynamic Outline - Car Body Movements (line 6 "Wheel-rail clearance" - 0.25 in.) Please confirm this number is correct	02/28/22	MJS	DE	Section to be updated with operator-approved composite clearance envelope(s).				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.025	Section 7.3.2	HL	10/18/18	LEGACY Comment Cal18.018 - (Clouded text) "..but may project over the top of the walkway envelope." Please define or provide reference of this walkway envelope	02/28/22	MJS	C	NFPA 130, Section 6.3.2.1, defines and governs the minimum dimensions of emergency egress route walkway as follows: "The means of egress within the trainway shall be provided with an unobstructed clear width graduating from 610mm (24") at the walking surface to 760mm (30") at 1575mm (62") above the walking surface to 430mm (17") at 2025mm (80") above the walking surface."				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with relevant criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.026	Section 7.3.6.1 Table 7.11	HL	10/18/18	LEGACY Comment Cal18.019 - Table 7.11, Minimum Horizontal Clearance (line items 1-2, under "Caltrain" currently states 8 ft 3 in.) CPUC requirement is 8'-6"	02/28/22	MJS	A	CPUC GO 26-D, Section 3 - Side Clearances, under subsection 3.2 states the following: "All structures and obstructions above the top of the rail except those hereinafter specifically mentioned.. 8'-6". NOTE: Posts, pipes, warning signs, and similar obstructions should, where practicable, have a side clearance of ten (10) feet." Updated to 9'-3" per CAHSR FI agreement				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.027	Section 7.3.6.1 Table 7.11	ZB	10/18/18	LEGACY Comment Cal18.020 - Table 7.11, Minimum Horizontal Clearance (line item 1 "Track centerline to face of tunnel wall, signal, or OCS poles") A minimum horizontal clearance of 10'-0" from TCL to face of permanent structure is required by Electrification Design Criteria.	02/28/22	MJS	A	CPUC GO 26-D, Section 3 - Side Clearances, under subsection 3.2 states the following: "All structures and obstructions above the top of the rail except those hereinafter specifically mentioned.. 8'-6". NOTE: Posts, pipes, warning signs, and similar obstructions should, where practicable, have a side clearance of ten (10) feet." Updated to 9'-3" per CAHSR FI agreement				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC

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Cal.028	Section 7.3.6.1 Table 7.11	ZB	10/18/18	LEGACY Comment Cal18.021 - Table 7.11, Minimum Horizontal Clearance (line item 2 "Track centerline to at-grade signal and OCS poles") A minimum horizontal clearance of 9'-3" from TCL to face of pole is required by Electrification Design Criteria.	02/28/22	MJS	A	CPUC GO 26-D, Section 3 - Side Clearances, under subsection 3.2 states the following: "All structures and obstructions above the top of the rail except those hereinafter specifically mentioned.. 8'-6". NOTE: Posts, pipes, warning signs, and similar obstructions should, where practicable, have a side clearance of ten (10) feet." Updated to 9'-3" per CAHSR FI agreement				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.029	Section 7.3.6.1 Table 7.11	ZB	10/18/18	LEGACY Comment Cal18.022 - Table 7.11, Minimum Horizontal Clearance (line item 3 "Track centerline to face of tunnel/station wall (condition where no walkway") This needs to be revisited once the comments above are addressed.	02/28/22	MJS	A	There is no condition where a walkway is not present, removed line				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.030	Chapter 7 Section 7.1.2; (Page 7-2 of 15)	PCG	06/17/22	Maximum Speeds on Curves: What is the approved maximum cant deficiency of the new Caltrain Stadler fleet and of the CHSR fleet?	09/01/22	MJS	C	The geometry requirements are defined by Caltrain Design Criteria (Max. 3" unbalanced superelevation.				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
Cal.031	Chapter 7, Section 7.2.6.2: (Page 7-6 of 15)	JP	06/30/22	Add sentence to end of section; 'Unbalanced superelevation that exceeds 3 inches must be justified by analysis for vehicle type and submitted to FRA by designer for approval.' From the latest task 337.2.1 Track_Draft Plans (TR-3104, 3107 and 3108), it shows more than 3 inches of Eu.	09/01/22	MJS	C	Design Team to address DTX track design unbalance for curve MT2-11 (Eu = 3.03). Future PAX tracks (by others) have 4.5"+ of unbalance (speeds not yet determined. No change to DTX Design Criteria required.				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
Cal.032	Chapter 7, Section 7.3.1.2; (Page 7-14 of 15)	BZ	06/30/22	Table 7.6, Vehicle Dynamic Outline - Car Body Movements (line 6 "Wheel-rail clearance" - 0.25 in.) Please confirm this number is correct	09/01/22	MJS	A	Added a clause/condition under Table 7.6: "* The values presented for magnitude in Table 7.6 are subject to change once CHSRA has selected their train manufacturer."				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
Cal.033	Chapter 7, Section 7.3.5.1; (Page 7-14 of 15)	JP	06/30/22	revise 'Table 7-7' to Table 7.8	09/01/22	MJS	A	Editorial: Tables, figures, equations, and all cross-references will be reviewed and updated as required.				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC
Cal.034	Chapter 7, Section 7.3.5.1; (Page 7-14 of 15)	BZ	06/30/22	Table 7-8 - Change tolerances to +- 0.125 for Ballasted and Direct Fixation track. Refer to Caltrain Specs 20400 for track constuction tolerance.	09/01/22	MJS	C	Caltrain track construction tolerance requirement for ballasted track is 0.5" (vertical and horizontal). The DTX Design Criteria may need to be updated once Caltrain publishes updated Caltrain Standard Specifications (end of 2020)				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC
Cal.035	Chapter 7, Section 7.3.5.2; (Page 7-14 of 15)	JP	06/30/22	revise 'Table 7-8' to Table 7.9	09/01/22	MJS	A	Editorial: Tables, figures, equations, and all cross-references will be reviewed and updated as required.				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC
Cal.036	Chapter 7, Section 7.3.6; (Page 7-15 of 15)	JP	06/30/22	revise 'Table 7-9' to Table 7.10 revise 'Table 7-10' to Table 7.11	09/01/22	MJS	A	Editorial: Tables, figures, equations, and all cross-references will be reviewed and updated as required.				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC
Cal.037	Chapter 7, Section 7.3.6; (Page 7-15 of 15)	BZ	06/30/22	Table 7.10: Minimum Horizontal Clearance: What the "*" is noted for?	09/01/22	MJS	A	It was a reference to a footnote that was accidentally deleted (now included): "Clearance dimensions for infrastructure assets must be verified against CPUC GO-26D clearances once CHSRA rolling stock is identified.				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC

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HSR.001	All references	DMcL	03/15/22	Is the use of the word 'must' correct in this document	05/10/22	MJS	C	The TJPA/PMPC Team have agreed upon using the imperatives for the DTX Design Criteria Revision Book 02.				05/13/22	MM	The responder (PMPC Team) has determined that the language is consistent with project standards.	05/13/22	CC
HSR.002	All references	DMcL	03/16/22	The abbreviation for California High Speed Rail should be CAHSR. Please amend accordingly.	05/10/22	MJS	B	"CHSRA" stands for California High-Speed Rail Authority, i.e., the state authority, in all instances in this chapter. The program generally does not abbreviate the term "California high-speed rail"				05/13/22	MM	The responder (PMPC Team) has determined that the language is consistent with project standards.	05/13/22	CC
HSR.003	subheading 7.1	DMcL	03/16/22	Design speeds should be rounded down to the nearest 5mph, AFFECTS: Caltrain	05/10/22	MJS	A	Revised sentence to read as follows: "Round down calculated design speeds to the nearest increment of 5 mph."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.004	subheading 7.1.2	DMcL	03/16/22	In agreement that the formula quoted calculates the maximum speed achievable on a curve, however there doesn't seem to be a formula for calculating the Equilibrium Superelevation from which the design superelevation, unbalance and spiral lengths can be calculated AFFECTS: Caltrain and CHSRA	05/10/22	MJS	C	This equation is already provided, see formula (7.9) in section 7.2.7.1 - Calculation of Superelevation.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.005	subheading 7.2.7.2	DMcL	03/16/22	Where have the all the values for superelevation in Table 7-3 been taken from as there is no mention of these in the Caltrain Design Criteria, Chapter 2 - Track AFFECTS: Caltrain	05/10/22	MJS	DE	DTX Design Criteria REV 01, released in 2009 and reviewed by the Operators in 2016/2018 included Table 7-3 - Maximum Superelevation. Absolute maximum values for actual (5 in) and unbalanced superelevation (3 in) are stated in the Caltrain Design Criteria, Chapter 2 - Track, Part C - Track, subsections 4.0-4.2. Desirable values for actual (currently 4 in) and unbalanced superelevation (currently 3 in) were updated based on Caltrain comments. The "Maximum negative unbalance for slowest operating speed on curve" line has been removed and a sentence added after the table noting that negative unbalance will be avoided.	06/27/22	BCC	In October 2018 a Basis of Design Memo was approved by Caltrain and CAHSR which amended the Caltrain Design Criteria in Sections 1, 4 1nd 5.2. These amendments should be used between San Francisco to South of CP Lick. I would have thought these should also form part of the DTX Project as it is on the Caltrain ROW. If these were not issued it will need confirmation that these have not to be used and highlighted accordingly (I do note that the maximum superelevation in the 2020 version of the Caltrain Design Criteria is quoted as 5 inches)	10/07/22	MJS	The responder (PMPC Team) has reviewed the backcheck comment provided by CHSRA and reviewed the 2018 Basis of Design Memo. Given the proposed MAS for the project limits and lack of agreement between TJPA regarding applicability to the DTX project, this comment will remain unchanged for this version of the DTX Design Criteria (living project document). The PMPC Team agrees to carry forward this concept/conflict for further discussion and resolution in the next phase of design.	10/07/22	CC
HSR.006	subheading 7.2.7.2	DMcL	03/16/22	There is the mention of a spiral transition curve, not aware that the element is called that in the railroad industry, either a spiral or transition should suffice. AFFECTS: Caltrain and CHSRA	05/10/22	MJS	A	Revised all references to "spiral curves"	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.007	subheading 7.2.1	DMcL	03/16/22	The minimum tangent length should be tabulated similar to the Caltrain Design Criteria, table 2-2 for ease of reading AFFECTS: Caltrain	05/10/22	MJS	C	Table 7-5 - Minimum Tangent Length at Turnouts (section 7.2.10 Turnouts)				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.008	subheading 7.2.1.1	DMcL	03/16/22	Where have the values in Table 7-1 come from as the track center distances for the main line on tangent track is 15 feet, my understanding was that the Caltrain standards were being used for track center to center dimensions. AFFECTS: Caltrain	05/10/22	MJS	B	Table 7-1 - Minimum Tangent Track Spacing is based on previous agreement with Caltrain during the development of the DTX Design Criteria. The PMPC and Design teams have both confirmed that the spacing is compliant with CPUC General Order 26-D.	06/27/22	BCC	Please supply evidence of this agreement to CAHSR RDP team for our records	10/06/22	MJS	The desirable values are taken from Caltrain Design Criteria (2-C.3.1), Absolute minimum for mainline to mainline is from DVR0010. The responder (PMPC Team) provided the source material requested therefore this comment is considered closed.	10/06/22	CC
HSR.009	subheading 7.2.1.2	DMcL	03/16/22	Is the last sentence in this section required as tangent track is not curved nor superelevated. AFFECTS: Caltrain	05/10/22	MJS	A	Revised to read as follows: "Track spacing must be adjusted to account for track curvature.."				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.010	subheading 7.2.2	DMcL	03/16/22	Throughout the document to date the radii of curves are specified as Degree of Curvature. The Design Criteria should pick on method of measurement for radii and adjust accordingly AFFECTS: Caltrain	05/10/22	MJS	B	Degree of curvature and radius of curve are easily converted and are typically both provided on track design plans. Caltrain Design Criteria expresses both as variables in formulas.	06/27/22	BCC	Caltrain Design Criteria, 3.3.2 states that the circular or simple curve shall be defined by its degree of curvature. Please amend accordingly	10/06/22	MJS	The following has been added to section 7.2.2: "Circular curves for track geometry will be defined by radius and equivalent degree of curvature (Dc)." The DTX Design Criteria will prioritize radius of curve but require track geometry to include radius of curvature. This comment is considered closed.	10/06/22	CC
HSR.011	subheading 7.2.2.1	DMcL	03/16/22	Where has the formula for minimum length of curve been taken from, but the 100 feet mentioned after is acceptable AFFECTS: Not in Caltrain	05/10/22	MJS	A	Formula 7.3 removed as there is no tie to source from either Caltrain or CHSRA criteria.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.012	subheading 7.2.2.2	DMcL	03/16/22	Agree with the formula for calculating the minimum radius of curve, however the absolute minimum radius of curvature is less than the 650 feet quoted due to the similar flexure turnout being placed on the 650 feet radius. This section needs rewording if it applies to the main line explaining the reason why AFFECTS: Caltrain and CHSRA	05/18/22	MM	A	Section has been updated to reflect that 650 ft minimum is for mainline tracks and 500 ft minimum is for Caltrain-only tracks. The curved crossover on the 650 radius cited in the comment allows access to a Caltrain platform and is therefore for Caltrain-only use.				05/18/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/18/22	CC
HSR.013	subheading 7.2.3	DMcL	03/16/22	No mention in the Caltrain Design Criteria that the minimum length of spiral must be 100 feet AFFECTS: Not in Caltrain	05/10/22	MJS	C	Caltrain Design Criteria, Chapter 2, Part C, Section 5.1 Application of Spirals: "..however, a minimum curve length of 100 feet shall be implemented."	06/27/22	BCC	My understanding for the 100 feet quoted in Section 5.1 is that this is when a circular curve is used instead of a clothoid spiral. It just so happens to confirm the minimum length of circular curve	10/06/22	MJS	The responder (PMPC Team) met with Caltrain for a CRM on chapters 7 and 8 where this topic was discussed. Caltrain is satisfied with the existing language - no change required. This comment is considered closed.	10/06/22	CC
HSR.014	subheading 7.2.7.1	DMcL	03/16/22	The formula is for Equilibrium Superelevation (cant plus cant deficiency), not superelevation (cant). Cant is what will be applied to the track with the remainder being unbalance (cant deficiency). This is quite correctly shown later	05/13/22	MM	A	Reviewer is correct, formula has been updated.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.015	subheading 7.2.7.2	DMcL	03/16/22	Table 7-3, where have these values come from. Also the subheading needs to be looked at again and rewritten where appropriate e.g. curves on platforms !. Design speed is not based on a maximum unbalance of 3", this is just one of the factors used for calculating the maximum speed on a curve. AFFECTS: Not in Caltrain	05/10/22	MJS	A	See comment response to #HSR.005 for first part of comment. Deleted sentence "Design speed must be based on a maximum unbalanced superelevation of 3 inches."				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC

Transbay Program
Downtown Rail Extension (DTX)
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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
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HSR.016	subheading 7.2.8.1	DMcL	03/16/22	Is the formula shown the same as contained within the Caltrain Design Criteria, section 7.1 AFFECTS: Not in Caltrain	05/10/22	MJS	A	Updated formula (7.10) to match Caltrain Design Criteria; revised to read as follows: "Maximum design gradient, with curve compensation at 0.04 percent per degree of curve, if applicable, for grade up to maximum gradient (Gc) as follows: (7.10) Gc = G – 0.04Dc Where: Gc is the maximum gradient as a percentage. G is the gradient before as a percentage. Dc is the degree of vertical curvature in decimal degrees."				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.017	subheading 7.2.8.3	DMcL	03/16/22	this subheading should have a different heading -e.g. Grade	05/10/22	MJS	A	Revised subheading "7.2.8.3 Minimum Length of Gradient". Also updated references from "vertical tangent" to "vertical gradient".	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.018	subheading 7.2.9.1	DMcL	03/16/22	Where have all the formulae come from. The Caltrain Design Criteria just has the first one : L = (D*V^2*K/A)	05/10/22	MJS	C	Caltrain criteria does not have a minimum vertical curve length requirement. However, high-speed rail TM 2.1.2 provided minimum and desirable vertical curve lengths which were used for this DTX Design Criteria.	06/27/22	BCC	Section 7.2 of the Caltrain Design Criteria states …least the length of a vertical curve be less than 100 feet	10/06/22	MJS	The responder (PMPC Team) recognizes this oversight and has replaced the absolute minimum length of a vertical curve equations with 100 feet. This comment is considered closed.	10/06/22	CC
HSR.019	subheading 7.2.9.2	DMcL	03/16/22	The formula mentioned here has already been mentioned in the previous subheading, can this whole subheading be removed	05/13/22	MM	C	Previous section includes an equation for minimum length of curve, this section is for minimum radius.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.020	subheading 7.2.9.5	DMcL	03/16/22	The first paragraph seems similar to what is used in the TM for CAHSR for segments. Is this subheading actually required bearing in mind the location of the project	05/13/22	MM	C	Yes, the DTX project has complex geometry given the number of physical constraints in the urban core.				05/13/22	MM	The responder (PMPC Team) has determined that the language is consistent with project standards.	05/13/22	CC
HSR.021	subheading 7.2.10	DMcL	03/16/22	This subheading should be revisited and factually written , why not take the wording from the Caltrain Design Criteria.	05/10/22	MJS	A	Table has been updated based on Caltrain criteria Chapter 2, Table 2-2.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.022	subheading 7.3.1.2	DMcL	03/16/22	The Cross section and table would be better served on the same page	05/10/22	MJS	A	Revised as noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.023	Section 7.3.1.3	DMcL	03/16/22	Why not combine both sections	05/10/22	MJS	A	Agree, removed heading for Section 7.3.1.3.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.024	Section 7.3.5.2	DMcL	03/16/22	Where have the figures in Table 7-8 come from. Are the tolerances construction tolerances	05/10/22	MJS	A	Agree, table has been removed.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.025	Section 7.3.6	DMcL	03/16/22	The clearances in Table 7-9 don't seem correct although the 6'0" dimension is currently being used, but this may change once the CAHSR trainset is known AFFECTS: CHSRA	05/10/22	MJS	A	Table updated.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.026	Table 7-10	DMcL	03/16/22	Table 7-10, should the vertical distance to the tunnel crown not be 24' 6" same as the overhead structure AFFECTS: CHSRA	05/13/22	MM	A	Table updated.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.027	Chapter 7 General	DMcL	03/16/22	There is no mention of a continuous check rail (restraining rails) for the tight radius curve of 650 feet radius. From a study I have read it would seem that in the US they are using 500 feet and below, however there are times when greater than 500 feet they have been used. As we do not know what trainset CAHSR will be adopting I feel that an allowance should be made for the use of these. AFFECTS: CHSRA	05/18/22	MM	C	Guard rail criteria can be found in Chapter 8. The current design includes guard rails on the 650 ft radius curves.	06/27/22	BCC	In this comment I am discussing continuous check rails (restraining rails) which are in place to stop derailments on tight radius curve. As the 650 feet radius is on the approach to station platforms it may be worthwhile consdering having these in place	09/01/22	MJS	The responder (PMPC Team) agrees to investigate including tight curve restrainting rail requirements in the next version of the DTX Design Criteria (living project document). Restraining rails have been added to the PE design on tight radius curves.	10/07/22	CC
HSR.028	Chapter 7 General	DMcL	03/16/22	I cannot find anywhere that it quotes the minimum radius for using CWR. Is the designer satisfied that CWR can be installed on the 650 feet radius curve. AFFECTS: CHSRA	05/18/22	MM	C	The design team has experience using CWR on track as tight as 82' radius. The rail would need to be pre-bent before installation for radii less than 500'.							05/18/22	CC
HSR.029	Chapter 7 General	DMcL	03/16/22	As the crossovers on the 650 feet radius curve are likely to have an equivalent turnout radius less than the CAHSR trainset can use it would make sense that a paragraph is added into the design criteria highlighting this, AFFECTS: CHSRA	05/18/22	MM	A	Text has been updated to reflect that 650 ft minimum is for mainline tracks and 500 ft minimum is for Caltrain-only tracks. The curved crossover on the 650 radius cited in the comment allows access to a Caltrain platform and is therefore for Caltrain-only use.				05/18/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/18/22	CC
HSR.030	CAHSR/PG/001	PGi	07/03/22	Sec 7.2.1.2 -Tangent Track Spacing - Values in table do not match values in preceding paragraph for spacing between mainline tracks.	05/10/22	MJS	A	Revised as noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.031	CAHSR/PG/002	PGi	07/03/22	Table 7-10 - minimum horizontal clearances need to be listed separately for each infrastructure asset. Currently lists one horizontal value for tunnel walls, signal and OCS structure. These distances can differ.	05/10/22	MJS	B	A note has been added to the table that minimum horizontal clearances to each of these assets must be verified against CPUC GO 26-D clearances.	06/22/22	BCC	I disagree with the response and the change to refer to CPUC GO 26D clearances. Clearances in some instances differ to CPUC directive clearances and should be explicitly stated in the DCM to ensure no ambiguity for the civils contractor. To list clearances required to each infrastructure sub-set is not a big task	09/01/22	MJS	The responder (PMPC Team) agrees to provide clearances for the following conditions to match those provided in CHSRA Design Criteria Rev. 5. Therefore this comment is considered closed. Centerline of track to face of permanent structure (tunnel and at-grade) Centerline of track to face of fixed equipment (tunnel and at-grade) Centerline of track to edge of platform	10/12/22	CC

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HSR.032	CAHSR/PG/003	PGi	07/03/22	Table 7-10 - the listed minimum horizontal clearance for CAHSR is 9ft3in this is incorrect. Please advise where this figure was derived.	05/10/22	MJS	A	Revised to 8 ft 7 in.	06/22/22	BCC	The DCM has been revised to show a horizontal offset from track CL to tunnel wall as 8ft 7in, this is still incorrect. The minimum horizontal clearance for CHSR is 10ft 8in. This figure has been listed incorrectly on 2 occasions and I would ask where these figures are being derived.	10/12/22	MJS	The values provided in the DTX criteria for minimum horizontal clearances are derived from CPUC GO 26-D, Section 9, which states the following: "9.2 Minimum side clearances of railroad and street railroad tracks which are not used or proposed to be used for transporting freight cars shall be thirty (30) inches from the side of the widest equipment operated, except that for poles support trolley contact conductors between main line double tracks such distance may be decreased to twenty-four (24) inches." The last DTX Design Criteria (May 2009) listed this value for CHSRA as 8'-3". CAHSR FJ Blended criteria stated 9'-3". The CHSRA vehicle dynamic envelope (VDE) is the controlling clearance envelope of the DTX project. The maximum horizontal data point provided by CHSRA was 6.055 feet (assume 6'-1"). Adding 30" from CPUC results in 8'-7". Requiring 10'-0" clearance (an additional 25") of horizontal clearance on each side of all tracks would impact project cost by orders of magnitude. The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
HSR.033	CAHSR/PG/004	PGi	07/03/22	Table 7-10 - Lines 1 and 2 of this table state the same information, please advise if these should differ.	05/10/22	MJS	C	First line is below-grade, second line is at-grade	06/22/22	BCC	Agree with comment responses however listed horizontal clearance for CHSR is incorrect. States 9ft 3in this should read 10ft 8in.	10/12/22	MJS	The PMPC Team has reviewed CHSRA Design Criteria (Rev 5) Chapter 23 - Trackway Clearances. Section 23.2.1.2.1 Minimum Horizontal Clearances from High-Speed Rail Track Centerline. The 10'-8" dimension is to centerline of OCS poles (not face) so this dimension is not needed. The argument will be on the "Face of fixed equipment" being 10 feet (0 inches) clearance. Further coordination and agreement(s) between TJPA, CHSRA, and Caltrain are needed to resolve minimum horizontal clearance. Requiring 10' horizontal clearance to elements within the DTX tunnel would result in excessive and unnecessary cost given the low MAS (30mph max. within tunnel). The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
HSR.034	CAHSR/PG/005	PGi	07/03/22	Table 7-11 - clearance to tunnel crown is listed as 24ft6in desirable, 21ft6in absolute. These values do not align with the working values for CAHSR, please advise where these values were derived. CAHSR mandated values are 27ft desirable, 24ft6in absolute.	05/13/22	MM	C	Please see approved DVR 0011 allowable clearance = 21'-6".	06/22/22	BCC	Disagree with the response. CHSR DVR0011 deals with the along track positioning of OCS structures and not tunnel heights. Please can the consultant forward the supporting document they refer to. Additionally, approval of any previous DVR does not mean that those criteria can be applied wholesale across the infrastructure. The CHSR values are as stated in my original comment and must be complied with.	10/12/22	MJS	Refer to Transbay Transit Center FRA Sign-off documents prepared by PCPA and approved by TJPA and CHSRA in 2013. This document (separate from the previously referenced DVR0011) justifies the minimum vertical clearance of 21'-6". The responder (PMPC Team) recognizes the point made in the backcheck response from the commentor about the applicability of an approved design variance request (DVR 0011) - The FRA sign-off document, approved by CHSRA does set a precendence for low-speed tunnel conditions. The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
HSR.035	CAHSR/PG/006	PGi	07/03/22	This chapter refers to Chapter 17, Train Systems. I would like to review this chapter alongside its reference chapter to understand how clearances listed affect final contact wire height values.	05/10/22	MJS	C	Chapter 18, Rail Systems was not released for review when Chapter 7 was. All chapters were sent to the design team, Caltrain, and CHSRA for review comments.				05/13/22	MM	No further comments were received from this commentor subsequent to the release of Ch. 18; therefore this comments is considered closed.	05/13/22	CC
HSR.036	Table 7.12, Section 7.3.6.2, 7-13	EAS	10/01/18	LEGACY Comment HSR18.001 - Table 7.12 the minimum vertical clearance of 21' 0" does not meet the minimum allowable clearance of 23' 1" per the approved DCVR 0011	02/28/22	AG	B	DVR 0011 approved minimum allowable clearance = 21'-6". Table 7.12 has been updated to reflect approved DVR clearance.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.037	Section 7.1.2.1, 7-2	MBr	10/01/18	LEGACY Comment HSR18.034 - 7.1.2.1 Maximum Speeds through Turnouts - No. 8/9 turnout: 10 mph - trainset are restricted from operating over these turnouts due to the radius of curve within the turnout. (Trainsets cannot negotiate these turnouts) HSR trainsets cannot negotiate radii smaller than 650 feet.	02/28/22	MJS	B	According to Caltrain's third edition Design Criteria – Interim (dated August 2020) [Section 2.0.a, pp 2-24], lateral turnouts No. 8 and 9 are for yard use only.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.038	Section 7.2.2.2, 7-3	XB	10/01/18	LEGACY Comment HSR18.035 - 7.2.2.2 - minimum curve radii to be used by high-speed trains shall not be less than 650 feet.	02/28/22	AG	A	Revised per approved DVR 0001.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.039	Section 7.2.8.1, 7-6	MBr	10/01/18	LEGACY Comment HSR18.036 - 7.2.8.1 Maximum Gradient - the gradient and their associated vertical curves cannot be located where car coupling and uncoupling tasks would be normally performed. Car coupling and uncoupling must be performed on level track, zero vertical curve.	02/28/22	AG	A	Added last paragraph: "Vertical curves shall not be allowed where car coupling and uncoupling tasks would normally be performed. Car coupling and uncoupling must be performed on level track, zero vertical curve."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.040	Section 7.2.9.5, 7-7	MBr	10/01/18	LEGACY Comment HSR18.037 - 7.2.9.5 Combined Horizontal and Vertical Curvature - cannot be located where car coupling and uncoupling tasks would be normally performed. Car coupling and uncoupling must be performed on level track, zero vertical curve.	02/28/22	AG	A	Added last paragraph: "Added last paragraph: "Combined horizontal and vertical curves shall not be allowed where car coupling and uncoupling tasks would normally be performed. Car coupling and uncoupling must be performed on level track, zero vertical curve."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.041	Section 7.3.1.1 & Section 7.3.1.2, Figure 7.1, 7-9	XB	10/01/18	LEGACY Comment HSR18.038 - 7.3.1.1 / 7.3.1.2 - Recommend splitting these sections into Caltrain and HSR specific sections. Incorporate figure 7.1 (and associated notes) from the latest CHSR DCM, to reflect the static and dynamic outline for the HS trainset.	02/28/22	MM	C	TJPA has prepared a consolidated design criteria for this project-specific design criteria which is to provide clearances for both operators.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.042	Table 7.5, 7-9	XB	10/01/18	LEGACY Comment HSR18.039 - Table 7.5 - to be annotated to state that the dimensions provided are for the Caltrain equipment. The dimensions for the HS trainset will be provided upon selection of the trainset.	02/28/22	MM	C	TJPA has prepared a consolidated design criteria for this project-specific design criteria which is to provide clearances for both operators.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.043	Section 7.3.1.2, Figure 7.1, 7-9	MBr	10/01/18	LEGACY Comment HSR18.040 - 7.3.1.2 Vehicle Dynamic Outline - Figure 7.1, Dynamic & Static Vehicle Outline on Tangent Track will disqualify the widebody CHSR trainset to operate within the DTX facility based on Figure 7.1	02/28/22	MM	C	TJPA has prepared a consolidated design criteria for this project-specific design criteria which is to provide clearances for both operators.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.044	Section 7.3.1.3, 7-11	XB	10/01/18	LEGACY Comment HSR18.041 - 7.3.1.3 - Vehicle inswing/outswing dimensions for the widebody HS trainset to be provided upon selection of the trainset.	02/28/22	MM	B	Inswing/outswing equations provided in CHSRA TM 1.1.10 used. The design criteria is a living document that will be updated once CHSRA has selected a vehicle.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.045	Section 7.3.2, 7-11	MBr	10/01/18	LEGACY Comment HSR18.042 - 7.3.2 Horizontal Running Clearances - based on 7.3.1.2 and Table 7.8 neither Caltrain EMU nor widebody CHSR Trainset can comply	02/28/22	AG	A	Clearance revised to 42" based on 10' TCL clearance and 6.5' dynamic vehicle outline per Appendix Figure 3.E.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.046	Section 7.3.5.2, 7-12	MBr	10/01/18	LEGACY Comment HSR18.043 - 7.3.5.2 Structure Tolerances are based on Table 7.8 and should only be specified after the value on Table 7.8 have been finalized.	02/28/22	MJS	B	Unless otherwise directed, the values provided in Table 7-8 will stand as the structure tolerances.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with applicable criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.047	Table 7.11, 7-13	XB	10/01/18	LEGACY Comment HSR18.044 - Table 7.11 - recommend the following revisions: Clearance to high-level walkway for CHSRA = 6 ft Track centerline to edge of level platform for CHSRA = 6 ft	02/28/22	AG	A	Per blended design criteria checklist: TCL to platform (Caltrain) = 5'-7" TCL to CHSRA platform = 6'-0"				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.048	Chapter 7 (General)	JD	10/01/18	LEGACY Comment HSR18.075 - Update CHSRA engineering criteria reference to current edition	02/28/22	AG	A	Updated references.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
TA.001	Chapter 7, Guideway Geometrics (General, header)	LZ	07/04/22	Delete "Transit Center" for consistency with the other chapters	09/01/22	KS	C	Unclear where there is inconsistency; however, updated one occurrence of "transit center" to "Salesforce Transit Center." Salesforce Transit Center is referenced in other sections where stations are discussed.				09/18/22	MJS	The responder (PMPC Team) will conduct an internal Quality Assurance/Quality Control (QA/QC) review to ensure there is consistent language throughout the document.	09/18/22	CC
TA.002	Chapter 7, Guideway Geometrics (Codes, Standards, and Guidelines)	LZ	07/04/22	In codes and standards there is no mention of Caltrain. It seems there should be, considering the section is about Guideway Geometrics	09/01/22	MJS	B	The first paragraph states the following: "These criteria are primarily governed by the Caltrain Design Criteria and incorporate approved design variances from Caltrain."				09/18/22	MJS	The responder (PMPC Team) clarified that the DTX guideway geometrics (Chapter 7) and trackwork (Chapter 8) are governed by Caltrain Design Criteria.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 109
Comments Closed 109
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 08, Trackwork*		
Document date:	*2/28/2022*		

Reviewers

Name	Initials	Name	Initials
Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
L. Godbold (Design Team)	LDG	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Pedro Gutierrez (Caltrain)	PCG
Rick Bartholomew (Caltrain)	RB	Bin Zhang (Caltrain)	BZ
Douglas McLoud	DMcL	M. Brunner (CHSRA)	MBr
Luis Zurinaga (SF CTA)	LZ		
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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GEC.001	Chapter 08 - Trackwork	SM	03/17/22	See tracked changes and review comments in "Chapter 08 Trackwork comments.pdf"	04/25/22	MJS	C	Incorporated into this CRL - See Comments #GEC.002-GEC.023	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.002	8.1.3 - Direct Fixation, ¶1-1	CU	03/17/22	This language implies a popular proprietary booted rail track system by Sonneville called "Low Vibration Track (LVT)." Broaden the language to allow the contractor to propose other track system types as the supplier technologies evolve. I suggest not making rail boots mandatory. Noise and vibration mitigation can be mitigated by high-resilience DF fasteners. Also, recent research indicate booted rail systems tend to experience corrugation issues. Therefore there should be performance language here or in specs to ensure suppliers demonstrate their products address such issues.	05/11/22	MJS	A	Agree, language will be added.	08/05/22	ROK	See related NEW Comments	9/30/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	9/30/2022	CC
GEC.003	8.1.3 - Direct Fixation, ¶1-1	CU	03/17/22	To give future contractors flexibility, please also include non-plinth option of pre-cast DF block track embedded in reinforced in-fill concrete. This construction method allows for faster installation in underground environments compared with cast-in-place DF trackwork.	05/11/22	MJS	A	Agree, language will be added.	08/05/22	BCC	The Draft DTX Design Criteria does not include this added language	9/27/2022	MJS	See responses to GEC.040 (Issue was addressed during CRM held with Caltrain and GEC on 9/27/2022)	9/27/2022	CC
GEC.004	8.1.3 - Direct Fixation, ¶1-1	CU	03/17/22	May be cast-in-place or pre-cast	05/11/22	MJS	A	Agree, language will be added.	08/05/22	BCC	The Draft DTX Design Criteria does not include this added language	9/27/2022	MJS	See responses to GEC.040 (Issue was addressed during CRM held with Caltrain and GEC on 9/27/2022)	9/27/2022	CC
GEC.005	8.1.4 - Embedded Track, ¶2-1	SM	03/17/22	What is to be used if designer can't demonstrate this?	05/11/22	MJS	A	Revised to read as follows: "The design of at-grade crossing track must conform with Caltrain Design Criteria. Refer to section 8.2.7 and section 8.7."	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.006	8.2.2 - Concrete Ties, ¶3-1	SM	03/17/22	This contradicts section 8.1.4 above.	05/19/22	MM	A	Embedded track section has been removed from criteria.	08/05/22	BCC	Embedded track construction is required at the flood control gates at the end of the U-wall.	9/27/2022	MJS	See responses to GEC.040 (Issue was addressed during CRM held with Caltrain and GEC on 9/27/2022)	9/27/2022	CC
GEC.007	8.2.2 - Concrete Ties, ¶5-1	SM/FB	03/17/22	In regards to "Concrete tie design must not be factored." - (SM) Not clear what this means. (FB) This is referencing AREMA Chap 30, Part 4 - but definitely needs clarification	05/13/22	MJS	A	Revised to read as follows: "Concrete tie design must not be factored and conform to AREMA Manual for Railway Engineering, Chapter 30, Part 4."	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	8.2.3 - Timber Ties, ¶1-2	FB	03/17/22	In regards to : "..9 feet in length" - Standard is 8'-6"	05/13/22	MJS	A	Revised as noted.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	8.2.3 - Timber Ties, ¶2-1	FB	03/17/22	Need to address fastening system: Spikes and anchors, or spring clips	05/13/22	MJS	A	Updated per Caltrain comment #Cal.008-009	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	8.2.3 - Timber Ties, ¶3-2	FB	03/17/22	What is length of transition section, and what is tie spacing?	05/13/22	MM	A	Text has been updated to reference Caltrain Standard Drawings for the transition section.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	8.2.6 - Geotextile Fabric, ¶1-3	FB	03/17/22	Define type of geotextile and its purpose. If for strength then maybe it should be geogrid.	05/13/22	MJS	B	Means and methods - should be left to the discretion of Design Builder.	08/05/22	BCC	Design team does not agree - This is not resolved	9/27/2022	MJS	Issue was addressed during CRM held with Caltrain and GEC on 9/27/2022	9/27/2022	CC
GEC.012	8.2.7 - Hot-Mix Asphalt Concrete (HMAC) Underlayment, ¶1-1	SM/FB	03/17/22	(SM) Where is this required (HMAC)? (FB) Areas of very soft subgrade? Is this the only acceptable solution for weak soils?	05/19/22	MM	C	For at-grade crossings. Text has been updated to reference Caltrain Design Criteria Chapter 2 - Track Park B - Track Structure.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.013	8.2.8.2 - Noise and Vibration Mitigation, ¶1-2	FB	03/17/22	Where is this requirement (required mitigation) defined?	05/19/22	MM	C	The 2018 SEIS/EIR. Text has been updated to reference this document.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.014	8.3 - Special Trackwork (Turnouts and Crossovers), ¶5-3	FB	03/17/22	What about the curved crossovers, non-standard numbers, MFPs?	05/19/22	MM	A	Non-standard trackwork requires a Design Variance Request to be submitted and approved by Caltrain. Text has been added to this end.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.015	8.5.1 - Rail Lubrication, ¶1-1	SM	03/17/22	Revise to read as follows: "..installed on all tracks to lubricate the following locations.." NOTE: One lubricator location can cover multiple curves on a track. A lubricator does not need to be installed at every curve.	05/09/22	MJS	A	Revised as noted.	08/05/22	BCC	Lubricators are typically only installed at one end of a curve at the incoming end based on the predominant direction of travel, not both ends as stated.	9/1/2022	MJS	Section revised to address this reopened comment.	9/27/2022	CC
GEC.016	8.5.1 - Rail Lubrication, ¶1-1	FB	03/17/22	Revise to read as follows: "..(Volume 1 Track, Chapter 5, part 5, and section 5.8.."	05/09/22	MJS	A	Revised as noted.	08/05/22	BCC	Reference to AREMA seems to have been erased.	9/1/2022	MJS	Section revised to address this reopened comment.	9/27/2022	CC
GEC.017	8.5.2 - Bumping Posts, ¶1-2	CU	03/17/22	"three ties" applies for ballasted track	05/19/22	MM	A	Agree. Removed reference to three ties.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.018	8.5.2 - Bumping Posts, ¶1-4	CU/SM	03/17/22	(CU) Suggest replacing "stopping envelope" with "stopping distance" (SM) 20' seems short. Should provide a performance requirement. Assumed speed and required stopping distance.	05/19/22	MM	A	Agree. Replaced text as follows: "Bumping posts must be designed to protect passengers and crew on the train, adjacent trains, and the platforms in the event of an over-run. The design must consider the track configuration, maximum likely speed, and rolling stock characteristics."	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.019	8.5.2 - Bumping Posts, ¶1-4	FB	03/17/22	Hydraulic or sliding? What is the relation of the insulated joint to the face of the bumping post?	05/13/22	MJS	A	Revised per comment #Cal.021	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.020	8.6.1 - Guard Rails	FB	03/17/22	Type? RE or U69?	05/25/22	MJS	DE	Type will be defined at next revision of the DTX Design Criteria	08/05/22	BCC	This is a deferred comment, not a closed one.	9/27/2022	MJS	Issue was addressed during CRM held with Caltrain and GEC on 9/27/2022	9/27/2022	CC
GEC.021	8.6.2 - Derailment Containment Devices	FB	03/17/22	This is not a Derail. Change title to "Derails"	05/09/22	MJS	A	Revised as noted.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.022	8.6.2 - Derailment Containment Devices, ¶1-1	FB	03/17/22	Cannot verify nor evaluate (reference to Caltrain Design Criteria)	05/09/22	MJS	C	The reference to Caltrain Design Criteria is accurate.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.023	8.7 - At-Grade Crossings	CU	03/17/22	Encroachment of special trackwork into at-grade crossings should be avoided. Where unavoidable, low-profile embedded track turnouts may be used.	05/19/22	MM	A	Embedded track section has been removed from criteria.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.024	Section 8.1.2 Page 8-1 of 5	LDG	09/12/16	LEGACY Comment GEC16.030 - 8.1.2 Add "(including elastic fastening system)" after the word "ties".	02/28/22	AG	A	Added.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.025	Section 8.1.3 Page 8-1 of 5	LDG	09/12/16	LEGACY Comment GEC16.031 - 8.1.3 Add "(reinforced plinth pads)" after word "seats".	02/28/22	AG	A	Added.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC

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GEC.026	Section 8.1.3 Page 8-1 of 5	LDG	09/12/16	LEGACY Comment GEC16.032 - 8.1.3 Add "special trackwork (turnouts and crossovers)" after the word "fastenings".	02/28/22	AG	A	Added.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.027	Section 8.2.1 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.033 - 8.2.1 Change AREMA reference to most current: AREMA Manual for Railway Engineering, Volume 1A Track, CHAPTER 4 RAIL, Part 1 Design of Rail and Part 2 Manufacture of Rail.	02/28/22	AG	B	Revised text to read: "...AREMA Manual for Railway Engineering." It is preferred to not over specify reference section to avoid missing information.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with relevant criteria; therefore this comment is considered closed.	8/5/2022	CC
GEC.028	Section 8.2.1 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.034 - 8.2.1 Section 2 – recommend that high strength rail …."shall be used in all special trackwork, in curves with a radius which is less than or equal to 1910.08 feet (3° curve) and in all spirals of curves which have a central curve with a radius which is less than or equal to 1910.08 feet (3° curve)."	02/28/22	MJS	B	See response to Caltrain comments Cal18.024 and Cal18.025. Revised text to read as follows: "..with a Brinell Harness Number of 370 will be used in all special trackwork and new tracks."	08/05/22	ROK		8/5/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.029	Section 8.2.1 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.035 - 8.2.1 Section 4 – Recommend adding minimum length for CWR strings and allowing thermite welds for special trackwork and for connecting CWR strings.	02/28/22	MJS	C	There is no minimum CWR string length in the Caltrain Design Criteria (third edition, dated August 31, 2020)	08/05/22	ROK		8/5/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.030	Section 8.2.2 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.036 - 8.2.2 Section 1 – Add "running" after words: mainline, yard and revenue.	02/28/22	AG	A	Added.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.031	Section 8.2.2 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.037 - 8.2.2 Section 2 – After the word "Engineering" add: "Volume 1b Track, Chapter 30 Ties, Part 4 Concrete Ties."	02/28/22	AG	B	Revised text to read: "...AREMA Manual for Railway Engineering." It is preferred to not over specify reference section to avoid missing information.	08/05/22	ROK		8/5/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.032	Section 8.2.2 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.038 - 8.2.2 Add new section: "Concrete ties with fastening system shall be tested as a unit and shall meet all test recommendations of AREMA Section 4.9 Testing of Monoblock Ties."	02/28/22	AG	A	Added paragraph: "Concrete ties with fastening system will be tested as a unit and must meet all test recommendations of AREMA Manual of Railway Engineering."	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.033	Section 8.2.2 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.039 - 8.2.2 Add new section: Concrete tie design shall not be factored.	02/28/22	AG	A	Added, "Concrete tie design will not be factored."	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.034	Section 8.2.3 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.040 - 8.2.3 Section 2: After the word "trackwork" add: "except for special trackwork on direct fixation".	02/28/22	AG	A	Added.	08/05/22	ROK	See related NEW Comments	9/30/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	9/30/2022	CC
GEC.035	Section 8.2.3 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.041 - 8.2.3 Section 3: After the word "Engineering" add: "Volume 1b Track, Chapter 30 Ties, Part 3 Solid Sawn Timber Ties."	02/28/22	AG	B	It is preferred to not over specify reference location to avoid missing information.	08/05/22	ROK		9/30/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.036	Section 8.2.3 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.042 - 8.2.3 Section 4: Recommend changing transition tie layout from 10 foot long ties to: "fifteen ties 11 feet long followed by sixteen ties 10 feet long all on 19.5 inch centers. The 15 foot long ties shall be adjacent to the track with the highest modulus"	02/28/22	MJS	B	Caltrain Design Criteria (third edition, dated August 31, 2020) governs trackwork criteria per Operators agreement memorandum. The criteria will match Caltrain's transition tie layout schema.	08/05/22	ROK		9/30/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.037	Section 8.2.4 Page 8-3 of 5	LDG	09/12/16	LEGACY Comment GEC16.043 - 8.2.4 Add section: "Ballast under concrete ties shall meet the recommendations of AREMA Manual of Railway Engineering Volume 1A Track, Chapter 1 ROADWAY AND BALLAST, Part 2 Ballast and shall be limited to crushed granites, traprocks or quartzites. Ballast shall be graded to AREMA No. 4 (1-1/2" to ¾")."	02/28/22	MJS	B	Caltrain Design Criteria governs trackwork per Operators agreement memo. Revised section to read as follows: "Reference Caltrain Design Criteria Chapter 2 – Track, Section 5.0 – Ballast."	08/05/22	ROK		9/30/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.038	Section 8.2.6 Page 8-3 of 5	LDG	09/12/16	LEGACY Comment GEC16.044 - 8.2.6 Recommend discussion with geotech about location of geotextile fabric. Design Criteria says between ballast and subballast. Many projects call for filter fabric between subballast and roadbed. Geogrids and fabrics should be discussed.	02/28/22	MJS	B	Caltrain Design Criteria (Third Edition, dated August 31,2020) states the following: "To increase the performance life and reliability of the track structure, biaxial geogrid shall be included in the subballast design, unless the subgrade and an R-value greater than 40 or will be stabilized with lime or cement. Where the subgrade is soft or has relatively poor drainage, the subballast shall be increased to 12 inches over geofabric; or, if necessary, shall consist of at least 8-inch-thick HMAC over geofabric."	08/05/22	ROK	See related NEW Comments	9/30/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	9/30/2022	CC
GEC.039	Section 8.4 Page 8-4 of 5	LDG	09/12/16	LEGACY Comment GEC16.045 - 8.4 Recommend removing word "specifications" and replace with: "Manual of Railway Engineering Volume 1A Track, Chapter 4 Rail, Section 3.8 SPECIFICATIONS FOR BONDED INSULATED RAIL JOINTS."	02/28/22	AG	A	Replaced "specifications" with "Manual of Railway Engineering".	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.040	8.1.3 Direct Fixation Track	CU	07/01/22	(First sentecne "..(reinforced plinth pads).." - replace with: " embedded in reinforced plinths or reinforced infill slabs"	09/01/22	MJS	A	Revised as noted.				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC
GEC.041	8.2.1 Running Rail	CU	07/05/22	(First sentence, third paragraph) Replace "1660 feet" with "1440 feet" per Caltrain Standard	09/01/22	MJS	A	Revised as noted.				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC
GEC.042	8.2.3 Timber Ties	CU	07/05/22	Revise first sentence to read as follows: "..temporary trackwork, including special tracwork on ballasted track as part of staged construction.;	09/01/22	MJS	A	Revised as noted.				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC
GEC.043	8.2.3 Timber Ties	CU	07/05/22	(third paragraph) This should go under a new section titled "Transitions" Tracks shall be designed to provide smooth transition between different types and changing track modulus. Reinforced concrete bridging slabs shall be provided at transitions betwen direct fixation and ballast. In ballasted track areas with concrete or timber ties, longer ties shall be used per Caltrain Standard Drawings to transition between standard tie zones and high modulus special trackwork or at-grade crossing zones. Direct fixation block spacing shall be adjusted between areas of standard fasteners and high-resilience fasteners.	09/01/22	MJS	A	Revised as noted.	10/07/22	CU	CRM held on 10/7 with Design Team (Chukwuma U.) where language was agreed and comment closed.	10/7/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/7/2022	CC
GEC.044	8.2.6 Geotextile Fabric	CU	07/05/22	(First paragraph) OK to replace with or reference language from Caltrain Design Criteria per comment GEC.038 response.	09/01/22	MJS	A	Revised as noted.				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 109
Comments Closed 109
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 08, Trackwork*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
L. Godbold (Design Team)	LDG	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Pedro Gutierrez (Caltrain)	PCG
Rick Bartholomew (Caltrain)	RB	Bin Zhang (Caltrain)	BZ
Douglas McLoud	DMcL	M. Brunner (CHSRA)	MBr
Luis Zurinaga (SF CTA)	LZ		
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.045	8.5.1 Rail Lubriation	CU	07/05/22	Revise first sentence to read as follows: "….and be installed to lubricate both ends of each curve on all tracks at the following locations.."	09/01/22	MJS	B	Revised section as follows: "Train-activated rail lubricators must conform with AREMA (Volume 1 – Track, Chapter 5, Part 5, section 5.9 Wayside Lubrication of Rail on Curves and the manufacturer's recommendations. The design and location of lubricators must and include an analysis to ensure the following locations are provided with sufficient lubrication to be installed at both ends of each curve on all tracks to lubricate the following locations to prevent excessive rail wear and provide noise abatement: •Curved approach to the DTX between Seventh and Townsend streets •Curved transition between Townsend and Second streets •Throat structure approach to the Transit Center directionRail lubricators located below grade must be designed to support remote monitoring, electronic type functioning system, and provide containment of the lubricant in case of malfunction or rupture of a hydraulic hose or valve.				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC
Cal.001	Chapter 8 Section 8.1.2	PCG	03/21/22	Referencing to section 8.7, change to section 8.1.4 Embedded track, as we are specifying embedded track to be used for at grade crossings	05/11/22	MJS	A	Removed reference to section 8.7 - At-Grade Crossings.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.002	Chapter 8 Section 8.1.3	PCG	03/21/22	change to read: "…….(turnouts and crossovers) guard rail and ……."	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.003	Chapter 8 Section 8.1.4	PCG	03/21/22	Embedded track is not in Caltrain standards, specify and reference a proven design to be used in addition to meeting other Caltrain design criteria	05/11/22	MJS	A	Revised section to "At-grade crossing track" to read as follows: "The design of at-grade crossing track must conform with Caltrain Design Criteria. Refer to section 8.2.7 and section 8.7."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.004	Chapter 8 Section 8.1.4	PCG	03/21/22	change to read: "…….guard rail and running rail……."	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.005	Chapter 8 Section 8.2.1	PCG	03/21/22	add Caltrain Standards, and specifications	05/09/22	MJS	A	Revised to read as follows: "Running rail for permanent tracks and special trackwork must be new. Running rail will be 136 RE rail section and must conform to Caltrain Standards. "	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.006	Chapter 8 Section 8.2.1	PCG	03/21/22	3rd paragraph - Change 132 to 136 # second hand rail, rail must meet main line specification and be pretested for internal defects	05/09/22	MJS	A	Third paragraph deleted. First paragraph modified as follows: "Running rail for permanent tracks and special trackwork must be new. Temporary tracks to support staged construction that will not be in service more than two years may be previously used but must be pretested for internal defects. Running rail will be 136 RE rail section and must conform to Caltrain Standards."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.007	Chapter 8 Section 8.2.1	PCG	03/21/22	4th paragraph - Change to, Rail must be manufactured and plant welded into minimum of 1660' rail lengths, 80' rail sections may be allowed to be flush butt welded within the project limits	05/09/22	MJS	A	Revised to read as follows: "Rail must be manufactured and plant welded into continuously welded rail with a minimum section length of 1660 feet. Within project limits, 80-foot-long rail sections may be welded by electric flash butt method."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.008	Chapter 8 Section 8.2.2	PCG	03/21/22	add Caltrain Standards, and specifications for main line track ties	05/09/22	MJS	A	Revised to read as follows: "Concrete ties must be used for all permanent at-grade mainline running tracks, yard running tracks, and non-revenue running tracks. Concrete ties must conform to Caltrain Standards." Note that Caltrain Standards include design criteria, standard drawings, and specifications. Also note that Caltrain design criteria already references AREMA manual for railway engineering.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.009	Chapter 8 Section 8.2.2	PCG	03/21/22	4th paragraph - Add: Fastening system must be galvanized or applied with a moisture/rust resistant paint coat	05/09/22	MJS	A	Added the following sentence: "Concrete tie fastening system must be galvanized or applied with a moisture and rust resistant paint."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.010	Chapter 8 Section 8.2.3	PCG	03/21/22	Left blank	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.011	Chapter 8 Section 8.2.4	PCG	03/21/22	Change to read: "Timber wood ties with 16" pandrol plates, e-clip and screw spikes may be used……."	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.012	Chapter 8 Section 8.2.4	PCG	03/21/22	add: ""…….standard timber tie sections, wood tie or concrete tie to direct fixation track standard concrete tie section and ……."	05/09/22	MJS	A	Text has been revised to point to Caltrain Design Criteria Chapter 2 Track, Section B - Track Structure - Subsection 5.0 Ballast.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.013	Chapter 8 Section 8.2.4	PCG	03/21/22	Change to read: "At approaches to bridges and at-grade crossings ……."	05/09/22	MJS	C	There are no bridges (that are not direct-fixation) within the DTX project limits.				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.014	Chapter 8 Section 8.2.9.1	PCG	03/21/22	change to read " ……be designed to resist corrosion in wet / dry environment, to maximize……." or specify heavy duty corrosion and wet / dry electrical resistant plates and fasteners, with double plate bonded elastomer be utilized such as XXX or equivalent	05/12/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.015	Chapter 8 Section 8.2.9.2	PCG	03/21/22	What is the required mitigation for noise and vibration?	05/13/22	MM	A	The required mitigations for noise and vibration are defined in the TJPA's 2018 Supplemental EIS/EIR. A reference to this document has been added to the design criteria.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.016	Chapter 8 Section 8.3	PCG	03/21/22	Remove No. 11 and No. 15 turnouts, they are not Caltrain standard turnouts	05/13/22	MM	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.017	Chapter 8 Section 8.3	PCG	03/21/22	Remove 'miter cut"	05/12/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.018	Chapter 8 Section 8.4	PCG	03/21/22	add: be factory assembled, meeting Caltrain Standards	05/12/22	MJS	A	Revised to read as follows: "Insulated joints must be prefabricated, factory assembled, epoxy-bonded, 36-inch, six-hole bar design assemblies conforming to AREMA Manual for Railway Engineering and Caltrain Standards."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.019	Chapter 8 Section 8.5.1	PCG	03/21/22	Recommend adding remote monitoring for rail lubrication within the below grade lubricators, lubrication system shall be design for remote monitoring, electronic type functioning system, and provide containment of the lubricant in case of malfunction or rupture of a hydraulic hose."	05/22/22	MM	A	Revised as noted	05/25/22	ROK		05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.020	Chapter 8 Section 8.5.1	PCG	03/21/22	How were this location determined? Recommend a study be performed by a qualified firm to determine rail lubrication requirements	05/19/22	MM	C	This is a comprehensive list of all curves in the project.				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 109
Comments Closed 109
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 08, Trackwork*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
L. Godbold (Design Team)	LDG	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Pedro Gutierrez (Caltrain)	PCG
Rick Bartholomew (Caltrain)	RB	Bin Zhang (Caltrain)	BZ
Douglas McLoud	DMcL	M. Brunner (CHSRA)	MBr
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
Cal.021	Chapter 8 Section 8.5.2	PCG	03/21/22	add: bumping post shall be hydraulic bumping post meeting / conforming to Caltrain new rail fleet. Some may be equipped with a red light?	05/12/22	MJS	A	Revised to read as follows: "Hydraulic bumping posts must be installed, at minimum, three ties before the end of the track or to conform with manufacturer's recommendations and be compatible with Caltrain's new rail fleet."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.022	Chapter 8 Section 8.6	PCG	03/21/22	Change to read: " Derailment Containment and Derails"	05/12/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.023	Chapter 8 Section 8.6.1	PCG	03/21/22	Restraining rails also called Guard Rails, they are also used on curved track, 8.6.1 requires that restraining rails be installed in tunnels which covers the entire below grade track	05/19/22	MM	A	Add text to acknowledge guard rails use on curved track.	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
Cal.024	Chapter 8 Section 8.6.2	PCG	03/21/22	Change 'Derailment Containment Devices to " Derailing Devices" or 'Derails" derails are not derailment containment devices,	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.025	Chapter 8 Section 8.6.2	PCG	03/21/22	first paragraph change to read: " The design and application of derails must conform to ……."	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.026	Chapter 8 Section 8.7	PCG	03/21/22	Add: "……..ad grade crossings shall be constructed as embedded track, the system must be of a proven design, meeting Caltrain Design Criteria and Standards and be submitted for approval" see Section 8.1.4 Embedded Track	05/09/22	MJS	B	Previous comment #Cal.003 stated that "embedded track" is not in Caltrain Design Criteria.				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.027	Section 8.1.3	AB	10/18/18	LEGACY Comment Cal18.023 - Any requirement for the transition zone from a ballasted track to a direct fixation track?	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-7]: "Transition ties shall be used in areas where track modulus changes significantly. These areas include approaches to bridges and at-grade crossings. Ten-foot-long transition timber ties shall be used for standard timber tie track segments, and 10-foot-long transition concrete ties shall be used for standard concrete tie track segments. Refer to Caltrain Standard Drawings for further details." See section 8.2.3	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.028	Section 8.2.1	HL	10/18/18	LEGACY Comment Cal18.024 - Section 8.2.1 Running Rail (second paragraph, striked text) - "..Brinell Hardness Number between 360 and 388.." Replace stricken text with "..minimum Brinell Hardness of 370.."	02/28/22	MJS	A	Revised to read as follows: "..with a Brinell Harness Number of 370 will be used in all special trackwork and new tracks."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.029	Section 8.2.1	HL	10/18/18	LEGACY Comment Cal18.025 - Section 8.2.1 Running Rail (second paragraph, striked text) - "..curves with radii that measure less than 1,150 feet." Replace stricken text with "..tracks."	02/28/22	MJS	A	Revised to read as follows: "..with a Brinell Harness Number of 370 will be used in all special trackwork and new tracks."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.030	Section 8.2.2	HL	10/18/18	LEGACY Comment Cal18.026 - 10 ft concrete ties shall be used for at-grade crossings	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-7]: Revised section to read as follows: "For at-grade crossings, concrete ties 10 feet in length, suitable for moisture-prone environment will be installed to accommodate crossing panels and enhanced load distribution for additional vehicular traffic."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.031	Section 8.2.3	HL	10/18/18	LEGACY Comment Cal18.027 - Section 8.2.3 Timber ties (second paragraph, striked text) - "Timber.." Replace stricken text with "Concrete.."	02/28/22	MJS	A	Removed second paragraph.	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.032	Section 8.2.3	HL	10/18/18	LEGACY Comment Cal18.028 - Section 8.2.3 Timber ties (after fourth paragraph, add following text) At approaches to at-grade crossings, if the at-grade crossing ties and the adjacent standard ties are both concrete, the transition ties shall also be concrete.	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-6]: "Only concrete ties shall be used for new construction of main tracks.." and [pp 2-7] "Standard ties for at-grade crossings are concrete suitable for moisture-prone environment. They are 10 feet long to accommodate concrete crossing panels, and to provide enhanced load distribution for additional vehicular traffic."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.033	Section 8.2.5	HL	10/18/18	LEGACY Comment Cal18.029 - Section 8.2.5 Subballast (last sentence): Please justify 3% cross slope	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-4]: "The top subgrade must be graded so that there is a minimum 2 percent cross slope toward the adjacent ditch or embankment slope, or to another longitudinal drainage system." Note, this section was revised/removed to read as follows: "Reference Caltrain Design Criteria Chapter 2 - Track, Section B - Track Structure, subsection 3.0 - Subballast."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.034	Section 8.3	HL	10/18/18	LEGACY Comment Cal18.030 - Section 8.3 Special Trackwork (Turnouts and Crossovers): second paragraph, second bullet No. 9 and No. 15 are not standard sizes in Caltrain Engineering standard	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Section 2.0, pp 2-24]: "a. Lateral turnouts numbers 8 and 9 for yards b. Lateral turnouts numbers 10, 14, 20, for main line; number 20 shall be used where there are no real estate constraints c. Number 9 double-slip switches may be used in terminals d. Turnouts with Hollow Steel Ties in accordance with Standard Drawings SD-2000 series shall be used for new constructions"	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

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Comments Closed 109
% Complete 100%

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 08, Trackwork*		
Document date:	*2/28/2022*		

Reviewers

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Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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Cal.035	Section 8.5.1	HL	10/18/18	LEGACY Comment Cal18.031 - Section 8.5.1 Rail Lubrication (revise first sentence to read as follows) "Train-activated rail lubricators shall be installed on all tracks to prevent excessive..."	02/28/22	MJS	A	Added	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.036	Section 8.6.2	HL	10/18/18	LEGACY Comment Cal18.032 - Section 8.6.2 Derailment Containment Devices (first sentence - "..such as low radius curves and special trackwork." Please provide more detail about when it will be installed? i.e. If it is radius related, under what radius will it be used? and what are the limits to use derailment containment. e.g. x feet ahead of and pass the TO, etc.	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Chapter 2.D, Section 3.0 DERAILS, pp 2-25]: "Derails shall be installed on the downgrade end of yard and secondary track that is normally used for storage of unattended vehicles, if this track is directly connected to the main track, and if its prevailing grade is descending toward the main track. With approval from the Caltrain Deputy Director of Engineering, derails may be used at other track locations where cars are moved or locomotives are stored, to prevent or minimize injury to passengers and personnel, and/or damage to equipment. Derails shall be located so that they derail equipment in a direction away from the main track. Derails shall be located beyond the clearance points of converging tracks. Double-point split-switch derails are installed at locations as required by Caltrain's Operations and Engineering departments, including locations where operating locomotives are stored and where cars are moved or switched by nonrailroad personnel." Updated/revised section to read as follows: "Reference Caltrain Design Criteria, Chapter 2 -Track, Section D - Special Trackwork, Section 3.0 - Derails.	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.037	Section 8.7	RB	10/18/18	LEGACY Comment Cal18.033 - Section 8.7 At-Grade Crossings (highlighted text "..in accordance with CPUC.." and FRA	02/28/22	MJS	A	Revised text to read as follows as Caltrain Design Criteria already requires conformance with ADA, FRA, and CPUC requirements: "Reconfiguration of surface trackwork and systems at existing or proposed at-grade crossings must conform with Caltrain Design Criteria."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.038	Chapter 8 Section 8.1.2; (Page 8-2 of 6)	PCG	06/15/22	second sentence: remove exception for at grade crossings. All at grade track shall be constructed with ballasted track including grade crossings.	09/02/22	MJS	A	Revised second paragraph as follows: "Ballasted track must be used for all at-grade mainline and non-revenue tracks including at-grade crossings."				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC
Cal.039	Chapter 8 Section 8.5.1; (Page 8-5 of 6)	BZ	06/30/22	Last paragraph: A study performed by a qualified firm to determine rail lubrication requirements is needed in the next phase design.	09/02/22	MJS	A	Revised section as follows: "Train-activated rail lubricators must conform with AREMA (Volume 1 – Track, Chapter 5, Part 5, section 5.9 Wayside Lubrication of Rail on Curves and the manufacturer's recommendations. The design and location of lubricators must and include an analysis to ensure the following locations are provided with sufficient lubrication to be installed at both ends of each curve on all tracks to lubricate the following locations to prevent excessive rail wear and provide noise abatement: •Curved approach to the DTX between Seventh and Townsend streets •Curved transition between Townsend and Second streets •Throat structure approach to the Transit Center directionRail lubricators located below grade must be designed to support remote monitoring, electronic type functioning system, and provide containment of the lubricant in case of malfunction or rupture of a hydraulic hose or valve.				9/27/2022	MJS	The PMPC Team met with Caltrain and the Design Team for a CRM held on 9/27/2022 where this isue was resolved.	9/27/2022	CC
HSR.001	All references	DMcL	03/22/22	Is the use of the word 'must' correct in this document	05/09/22	MJS	C	Verbiage has been selected and approved by the TJPA to be used in this DTX Design Criteria Revision Book 02				05/13/22	MM	The responder (PMPC Team) has determined that the language is consistent with project standards.	05/13/22	CC
HSR.002	8.1.1	DMcL	03/22/22	The track gauge will be 4 feet 8.5 inches, not just on tangent track except on tight radius curves where gauge widening may be required.	05/12/22	MJS	A	Revised to read as follows: "Track gauge will be 4 feet 8.5 inches, measured at 0.625 inches below the head of the rail on the gauge side on all tracks except on tight radius curves where gauge widening may be required."	06/27/22	ROK	Accepted with amendments. At what radius will gauge widening be required. Does the project have radii that fit the criteria, if so gage widening criteria needs to be shown	10/7/2022	MJS	The responder (PMPC Team) agrees to coordinate with operators and define threshhold for gauge widening and requirements will be addessed at the next stage of design. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/7/2022	CC
HSR.003	8.1.2	DMcL	03/22/22	My understanding is that ballasted track is in the design criteria due to the length of the project being extended	05/12/22	MJS	C	Ballasted track will be used for the at-grade portion of the alignment (Main line, Maintenance of Way, and Turnback Track) except for at-grade crossings at 16th Street and Mission Bay Drive.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.004	8.1.3	DMcL	03/22/22	In accordance with the Caltrain Design Criteria direct fixation track will not be used, (see Chapter 2, Track Section A- General)	05/13/22	MM	DE	Caltrain's Design Criteria are for at-grade trackwork. TJPA will seek a variance from Caltrain for this criteria due to the tunnel condition.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.005	8.1.4	DMcL	03/22/22	Where is the embedded track located on the project.	05/12/22	MJS	A	See response to comment #Cal.003. Will be updated.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.006	8.2.1	DMcL	03/22/22	A Brinell Hardness would normally be shown as BHN	05/12/22	MJS	C	Noted, however since this is only referred to once, there is no need to add the acronym.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.007	8.2.1	DMcL	03/22/22	3rd paragraph. Is there a likelihood that this may happen as it is temporary track and where is it located (also see 9 below), also what type of ties will any temporary track have. Also Caltrain Design Criteria states that all new track will be 136 RE rail on concrete ties.	05/12/22	MJS	A	Revised to read as follows: "Running rail for permanent tracks and special trackwork must be new. Temporary tracks to support staged construction that will not be in service more than two years may be previously used but must be pretested for internal defects. Running rail will be 136 RE rail section and must conform to Caltrain Standards."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.008	8.2.2	DMcL	03/22/22	How has the concrete tie spacing been calculated	05/12/22	MJS	C	Concrete tie spacing is 24 inches based on Caltrain Design Criteria Chapter 2 - Track, Part B - Track Structure, Section 6.0 - Ties.	06/27/22	ROK	Accepted but the PMPC response needs amending as the section for Ties is in : B Track Structure, Section 6 not 7.	10/3/2022	MJS	Revised as noted.	10/3/2022	CC
HSR.009	8.2.3	DMcL	03/22/22	Any temporary track should be mentioned as to possible location as previously the document states that all ties shall be concrete.	05/12/22	MJS	A	Revised second paragraph as follows: "Timber ties may only be used for temporary conditions and must conform to the requirements of the AREMA Manual for Railway Engineering."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.010	8.2.3	DMcL	03/22/22	Is the last paragraph required , i.e. where is there likely to be a change in track modulus on the project	05/13/22	MM	C	Yes. The DTX project includes at-grade trackwork including at-grade crossings for the turnback track.	06/27/22	BCC	Is this not a temporary situation ? Can a temporary non compliance not be put in place until the final construction is completed. Will the 'At Grade Crossings' not be on concrete ties ? If it is on slab I would expect to see a typical transition zone design.	10/3/2022	MJS	There will be a transistion in track modulus from the at-grade, ballasted concrete ties to the U-wall and tunnel (mined and cut-and-cover sections) direct fixation.	10/3/2022	CC

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HSR.011	8.2.4.and 8.2.5	DMcL	03/22/22	Where is the location that ballasted track will be required. I feel that the 2 sections could be expanded and the minimum depths added as a minimum	05/12/22	MJS	C	Ballasted track will be used for the at-grade portion of the alignment (Main line, Maintenance of Way, and Turnback Track) except for at-grade crossings at 16th Street and Mission Bay Drive. These sections refer to Caltrain Design Criteria and the specific sections that describe the Caltrain requirements.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.012	8.2.6	DMcL	03/22/22	Is there any special trackwork on ballasted track	05/13/22	MM	DE	Yes, the design is still being progressed, but there is special trackwork on ballasted track.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.013	8.2.8	DMcL	03/22/22	Is Other Track Material the correct heading to use for this section	05/12/22	MJS	A	Renamed Section header title to "Track Material Performance Requirements"	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.014	8.2.8.1	DMcL	03/22/22	Fastening systems have already been mentioned with concrete ties and should be removed from this sub section. Don't see fastening systems as OTM or System Safety and Reliability	05/12/22	MJS	B	Agreed that fastening system is already mentioned, but this subsection is discussing safety and reliability.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.015	8.3	DMcL	03/22/22	This section could be rationalized concentrating on the units that will be used. Perhaps a table showing type and location.	05/12/22	MJS	C	A table is of little benefit at this stage with minimal information.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.016	8.3	DMcL	03/22/22	For the crossovers on the 650 feet radius curve there should be a risk assessment carried out for its suitability to be positioned on the curve.	05/12/22	MJS	B	CHSRA has already agreed to the absolute minimum radius of curvature (650') as stated in DVR_0001. The curved crossover in the 650 radius curve is for Caltrain use-only as it provide access to the Caltrain platform.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.017	8.5.1	DMcL	03/22/22	Its section 5.8, not 5.9 and this should mention that the lubricators will be positioned in accordance with the manufacturer. I do not think that AREMA should be mentioned as the manufacturer would have had to get their product accepted for use by AREMA. AFFECTS: Caltrain and CHSRA	05/25/22	MM	A	Agree, lubricators must be installed per manufacturer's requirements. AREMA provides recommended practices, not standards.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.018	8.5.1	DMcL	03/22/22	Are the tracks bi-directional here as a lubricator would be required at both ends and this needs to be stated if so. AFFECTS: Caltrain and CHSRA	05/19/22	MM	A	Updated text per recommendation.	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
HSR.019	8.5.2	DMcL	03/22/22	Will each platform track have a bumping post at the termination of the track and will a risk assessment be carried out as to the position of these beyond the end of the train stop. Is there not a design criteria for Bumping Posts that the designer needs to follow AFFECTS: Caltrain and CHSRA	05/19/22	MM	A	Agree. Replaced text to provide a performance standard in line with the CHSRA criteria as follows: "Bumping posts must be designed to protect passengers and crew on the train, adjacent trains, and the platforms in the event of an over-run. The design must consider the track configuration, maximum likely speed, and rolling stock characteristics."	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
HSR.020	8.2.7	DMcL	03/22/22	What is the significance of placing guard rails at the end of CAHSR platforms and not others. Will a continuous check rail (restraining rails) not do the same job. Where did the 25 feet length come from ? AFFECTS: CHSRA	05/12/22	MJS	A	CHSRA platforms are high platforms which mitigate need for guard rail. Restraining rail will be used in the transit center. Will allow the use of restraining rails in section 8.6.1 since the term guard rail is sometimes used for restraining rail, will clarify terminology in the Design Criteria for the purpose of this project as follows: "restraining rails provide a narrow flangeway (1 5/8") to avoid derailment of a train through a tight radius curve (typically radius less than 500'). Guard rails are located further away from the running rails (10" gap) and attempt to control the movement of a derailed train. Guard rail typically are installed at raised portions of track or at the approaches to tunnels or structural elements that need protection." The 25 feet length was included in the original release of the DTX Design Criteria (2009).	05/25/22	ROK		05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
HSR.021	8.6.2	DMcL	03/22/22	Is there an actual requirement for derails based on the location for this project bearing in mind what their function is for. (CFR 213.357 states that each track other than a main track which connects to class 7,8 or 9 main track shall be equipped.) AFFECTS: Caltrain and CHSRA	05/19/22	MM	C	Section has been updated to reference Caltrain Design Criteria Chapter 2 - Track, Part D - Special Trackwork. There are at-grade maintenance-of-way and turnback tracks that are part of the DTX project.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.022	8.7	DMcL	03/22/22	What reconfiguration will be happening and at what Grade Crossing	05/19/22	MM	C	Locations referenced in first paragraph. The at-grade interlocking will be updated to provide a connection to both the DTX tracks and the Fourth and King Station.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.023	Section 8.3, 8-4	MBr	10/01/18	LEGACY Comment HSR18.045 - 8.3 Special Trackwork (Turnouts and Crossovers) CHSR trainsets cannot utilize No 8 & No. 9 turnouts	02/28/22	MJS	A	Turnouts No. 8 and No. 9 will not be used for mainline tracks nor for any CHSRA-train movements. Revised bullet to read as follows: "No. 8 and No. 9 lateral turnouts may be used in yard and non-revenue tracks where only Caltrain rolling stock will operate."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from CHSRA, thus the comment is considered closed.	05/09/22	CC
TA.001	Section 8.5.1, Rail Lubrication (First bullet)	LZ	07/04/22	Refers to approach to the DTX between 7th and Townsend sts. Should be "approach to the 4th and Townsend station", since the section between 7th and Townsend is already part of the DTX	09/02/22	MJS	A	Revised section as follows: "Train-activated rail lubricators must conform with AREMA (Volume 1 – Track, Chapter 5, Part 5, section 5.9 Wayside Lubrication of Rail on Curves and the manufacturer's recommendations. The design and location of lubricators must and include an analysis to ensure the following locations are provided with sufficient lubrication to be installed at both ends of each curve on all tracks to lubricate the following locations to prevent excessive rail wear and provide noise abatement: •Curved approach to the DTX between Seventh and Townsend streets •Curved transition between Townsend and Second streets •Throat structure approach to the Transit Center directionRail lubricators located below grade must be designed to support remote monitoring, electronic type functioning system, and provide containment of the lubricant in case of malfunction or rupture of a hydraulic hose or valve.				9/27/2022	MJS	The PMPC Team met with Caltrain and the Design Team for a CRM held on 9/27/2022 where this isue was resolved.	9/27/2022	CC
TA.002	Section 8.7, At-Grade Crossings	LZ	07/04/22	Sentence needs to be restructured for clarity	09/02/22	MJS	A	Revised as noted.				9/27/2022	MJS	The PMPC Team met with Caltrain and the Design Team for a CRM held on 9/27/2022 where this isue was resolved.	9/27/2022	CC

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Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 09, Geotechnical Requirements*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Marguerite Bello (Design Team)	MB	Jim French (Design Team)	JF
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Meghan Murphy (PMPC/AECOM)	MM
Amanda Kaku (PMPC/HCI)	AK		

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GEC.001	Design Criteria, Chap. 9	JF	03/17/22	See tracked changes and review comments in "Chapter 09_Geotechnical Requirements jf.docx"	04/25/22	MJS	C	See comments #GEC.012-GEC.059	05/17/22	ROK					05/17/22	CC
GEC.002	Chapter 9 - Geotechnical Requirements	MB	03/18/22	See tracked changes and review comments in "Chapter 09_Geotechnical Requirements with MB comments.docx"	04/25/22	MJS	C	See comments #GEC.061, GEC.062	05/17/22	ROK					05/17/22	CC
GEC.003	Chapter 09_Geotechnical Requirements, 9.1.2, page 9-5 of 12	YS	03/17/22	Suggest clarifying specific types of seismic tests required for rock explorations.	05/12/22	MJW	A	Agree, will clarify "seismic tests" to mean "downhole P-S log by OYO method or equivalent to collect shear wave and p-wave velocities in the rock."	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.004	Chapter 09_Geotechnical Requirements, 9.1.2, page 9-5 of 12	YS	03/17/22	Suggest including requirements for performing tests which would determine in horizontal situ stresses using hydraulic fracturing, over coring, or flat jack method.	05/12/22	MJW	A	Agree, will add in situ stress evaluations by ISRM (40, 2003) double packer test method, over coring by ASTM D4623, and/or flat jack testing by ASTM D4729.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.005	Chapter 09_Geotechnical Requirements, 9.1.9, page 9-7 of 12	YS	03/17/22	Suggest including requirements for performing direct shear tests on rock defects or joints to determine shear strength parameters of defects or joints.	05/12/22	MJW	A	Noting that the ASTM has been withdrawn, we will add a reference to testing strength of rock discontinuities via ASTM D4554-12.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.006	Chapter 09_Geotechnical Requirements, 9.2, page 9-8 of 12	YS	03/17/22	In GIR, the design parameters should include those for rock discontinuities such as joint spacing, dip angle, and dip directions, as well as those for seismic design such as shear wave velocity and dynamic strength parameters of soil and rock units.	05/12/22	MJW	A	Agree, will include bullet points for "design parameters for rock and rock discontinuities such as joint spacing, dip angle, and dip directions" and "seismic design parameters such as shear wave velocity and dynamic strength parameters of soil and rock units, and stiffness reduction curves for dynamic loading"	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.007	Chapter 09_Geotechnical Requirements, 9.2, page 9-8 of 12	YS	03/17/22	In GIR, the ground deformations or settlements as a result of groundwater drawdown if occurring due to excavation should be addressed.	05/12/22	MJW	A	Agree, will include a bullet point requiring evaluation of effects of groundwater drawdown.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.008	Chapter 09_Geotechnical Requirements, 9.2, page 9-8 of 12	YS	03/17/22	GBR is an important contractual document. Suggest providing more detailed guidance on the contents of this document, which should be covered.	05/12/22	MJW/ MM	A	We agree with this comment. However, the method of procurement has not yet been fully finalized, and thus the specificity we can provide at this time on the GBR contents may be inappropriate (if for example the procurement is progressive design-build, it may be a different set of contents than for a traditional design-build). The Gold book has a significant list of required contents for a GBR. Repeating that list would add redundancy so we will make a stronger reference to the list (starting from page 22 of the book) in the DCM. Revised to read as follows: "A GBR must be prepared for the mined tunnel portion of the project only, in accordance with the recommendations and list of required contents from the Underground Technology Research Council (ASCE 2007). "	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.009	Chapter 09_Geotechnical Requirements, 9.6.2, page 9-11 of 12	YS	03/17/22	For clarity, list in-tunnel convergence targets as part of ground movement measuring devices.	05/12/22	MJW	A	Agree will add tunnel convergence monitoring devices to list of instrumentation.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.010	Chapter 09_Geotechnical Requirements, 9.6.3, page 9-12 of 12	YS	03/17/22	Automatic data collection will not be limited to groundwater readings and should include MPBXs, surface settlements, utility settlements, etc. An online website for automatic data collection should be established for allowing monitoring the data and readings 24/7.	05/12/22	MJW	A	Agree and will revise this section, but potentially not in the way the reviewer would anticipate. Specification of monitoring frequency for the overall monitoring system will be reserved for either a spec or a technical requirement narrative. For the Design Criteria, this groundwater monitoring was meant more for what the designers would do during design development. This must be clarified here - transmittals every 2 weeks would be okay during design, but agree that during construction, data transfer would happen in real time and be hosted/displayed via an online system. The requirement for such a system is outside the scope of a design criterion. Revised to read as follows: "Monitoring schedules for each type of instrument installed must be established. The data must be submitted bi-weekly (during design) and real-time (during construction) to the TJPA for assessment to allow time for corrective action, if necessary."	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.011	Chapter 9 - Scope, ¶2-4	JF	03/17/22	Revise last sentence to read as follows: ".. Alone make these documents contractually reliable."	05/12/22	MJW	A	Agree, added word "contractually" to sentence.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.012	Chapter 9 - Scope, ¶3-1	JF	03/17/22	Move sentence from below to "Scope" section: "The subsections that follow specify the appropriate application of these codes, standards, guidelines, and references. Geotechnical investigations and analysis must be sufficient to obtain permits for the work."	05/12/22	MJW	A	Revised as noted	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.013	Chapter 9 - Codes, Standards and Guidelines, ¶1, Third bullet	JF	03/17/22	This is ASTM 4.08 (previous entry), so may not need to be relisted here	05/12/22	MJW	A	Agree, will remove redundant listing.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.014	Chapter 9 - References	JF	03/17/22	Add new sub-section header "Project-Specific Reference Documents"	05/12/22	MJW	A	Agree, added.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.015	9.1 - Subsurface Exploration and Testing, ¶1, First bullet	JF	03/17/22	Revise to read as follows: "Boreholes, utilizing standard penetration tests (SPTs) and other sampling methods.." This clarifies that "SPT" is a type of sampler rather than a type of borehole	05/12/22	MJW	A	Revised as noted	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.016	9.1 - Subsurface Exploration and Testing, ¶1, Second bullet	JF	03/17/22	Add "(CPTs)" acronym	05/12/22	MJW	A	Revised as noted	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.017	9.1 - Subsurface Exploration and Testing, ¶2-2,3	JF	03/17/22	It is a little awkward to switch here to the imperative mood from the "mode of obligation." (E.g., previous sentences has "… testing must suit…") I suggest sticking with one of the modes of obligation (shall or must) and not to use imperative for a Design Criteria.	05/12/22	MJW	A	Revised to passive voice	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.018	9.1 - Subsurface Exploration and Testing, ¶4-1	JF	03/17/22	Revise first sentence to read as follows: ".. must be submitted to the TJPA for review and approval; see Chapter…" I think the Design Criteria should bind the GEC, not the TJPA	05/12/22	MJW	A	Revised to passive voice	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.019	9.1.1 - Soil Explorations, ¶1-1	JF	03/17/22	Revise first sentence to read as follows: "Explorations within soil units must include an appropriate selection from the following methods:"	05/20/22	MJW	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.020	9.1.1 - Soil Explorations, ¶1, First Bullet	JF	03/17/22	Revise first bullet: "Rotary wash borings:"	05/12/22	JL	A	Agree. deleted "through" and add a colon (:)	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 104
Comments Closed 104
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 09, Geotechnical Requirements*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Marguerite Bello (Design Team)	MB	Jim French (Design Team)	JF
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
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Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Meghan Murphy (PMPC/AECOM)	MM
Amanda Kaku (PMPC/HCI)	AK		

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Review Team					PMPC Team					Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**		**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.021	9.1.1 - Soil Explorations, ¶1, Second and Third bullets	JF	03/17/22	Revise bullets to read as follows: oSoil sampling generally about once every 5 feet and at layer changes, with continuous sampling performed on an as-needed basis. Sampling may be increased generally to once every 10 feet and at layer changes outside of the tunnel horizon, defined as the tunnel section, and one diameter above and below the tunnel. Soil must be logged in accordance with the Caltrans Soil and Rock Logging Manual. oUndisturbed and relatively undisturbed sampling of cohesive materials. Where possible, use Osterberg or Dames & Moore piston sampler instead of Shelby tube sampling for soft to stiff cohesive materials.	05/20/22	MJW	B	Agree, will add "about" and switch "can" to "may" in first bullet. Disagree with adding Osterberg as an option in soft- to stiff materials. The D&M sampler has been shown to reduce sample disturbance in this locality better than other samplers of larger diameter (e.g. 101.6mm) because the sample preparation needed for the D&M is reduced (i.e. the sample fits right in the ring rather than requiring trimming). This is consistent with John Bray's methodology paper from June 2020 prepared for NZ Ministry of Business Innovation and Employment.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.022	9.1.2 - Rock Explorations, ¶1-1	JF	03/17/22	Revise first sentence to read as follows: "If bedrock is encountered.."	05/12/22	JL	A	Agree. swapped 'rock' with 'bedrock' only at this phrase, 'If rock is encountered...'.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.023	9.1.2 - Rock Explorations, ¶1, below second bullet	JF	03/17/22	Add the following sentence: "As part of the above-described explorations, an appropriate number of the following tests should be performed to adequately characterize the bedrock:" Above drilling methods are drilling methods, below are test methods within those explorations	05/12/22	JL	A	Agree. will add the sentence accordingly.		08/05/22	BCC	Sentence is still missing	09/01/22	JL	The sentence has been added.	09/30/22	CC
GEC.024	9.1.2 - Rock Explorations, ¶1, Third bullet	JF	03/17/22	Revise to read as follows: "Rock deformability (dilatometer and/or pressure-meter tests)"	05/12/22	JL	A	Agree. revised accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.025	9.1.2 - Rock Explorations, ¶1, Sixth bullet	JF	03/17/22	Revise to read as follows: "Acoustic televiewer and/or optical logging"	05/12/22	JL	A	Agree. revised accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.026	9.1.3 - Core Logging in Soil and Rock, ¶1-1&2	JF	03/17/22	Revise to read as follows: "A California-licensed geotechnical engineer or certified engineering geologist must continuously monitor the drilling and coring procedures, visually classify the rock core, or soil samples obtained, and prepare a field borehole log. There must be at least one geotechnical engineer or engineering geologist for each drilling rig."	05/12/22	JL	A	Agree. revised accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.027	9.1.3 - Core Logging in Soil and Rock, ¶1-4	JF	03/17/22	Does this intend to mean a CEG is needed to review soil classification performed by a GE? If not, this should be re-worded.	05/12/22	JL	C	We think the reviewer refers to this sentence, 'An experienced certified engineering geologist must also be on site to verify the classification of recovered rock and soil materials and aid on-site engineers, geologists, or other personnel.' Yes, an experienced CEG must be on site for the verification. No revision is needed.		05/17/22	ROK					05/17/22	CC
GEC.028	9.1.3 - Core Logging in Soil and Rock, ¶2-1	JF	03/17/22	Suggest re-wording away from imperative mood.	05/12/22	JL	A	Agree. will reword as follows "At the end of each day, rock cores must be placed in plastic core bags or double-wrapped in plastic wrap, which are then, placed in wooden core boxes, and transported to a storage facility."		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.029	9.1.3 - Core Logging in Soil and Rock, ¶2-3	JF	03/17/22	Rephrase "Photograph" in the imperative	05/12/22	JL	A	Agree. will reword as follows "The cores must be photographed; at least one photo for each core box and closeups of special features such as..."		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.030	9.1.3 - Core Logging in Soil and Rock, ¶2-4	JF	03/17/22	In reference to "the geologist's" - Previous paragraph indicated a GE or CEG could log; no mention was made for a non-CEG geologist (PG).	05/20/22	MJW	A	Agree, will revise to add the word "engineering" in front of "geologist."					8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.031	9.1.4 - Cone Penetration Tests, ¶1-1	JF	03/17/22	Revise to read as follows: "...ASTM standards, and the equipment must be capable.."	05/12/22	JL	A	Agree. will revise it accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.032	9.1.4 - Cone Penetration Tests, ¶3-1	JF	03/17/22	Remove "Excess" from beginning of sentence Normally referred to as a dissipation test (without "excess"); in some dense dilative soils pore pressures may increase for a while.	05/12/22	JL	A	Agree. will revise it accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.033	9.1.4 - Cone Penetration Tests, ¶4-1	JF	03/17/22	Revise to read as follows: "Interpretation of CPT results must follow the procedures described in "Guide to Cone Penetration Testing for Geotechnical Engineering," by Robertson & Cabal, 5th Edition, July 2012.	05/12/22	JL	A	Agree. will revise it accordingly.		08/05/22	BCC	Latest edition is the 6th Edition, 2015. Recommend update reference to 2015	09/01/22	JL	Agreed and revised the reference accordingly.	10/03/22	CC
GEC.034	9.1.5 - Field Vane Shear Tests, ¶1-2,3,4	JF	03/17/22	Revise to read as follows: "Test should usually be performed.." Small intervals may not always be appropriate, e.g., if a sand zone is encountered within Bay Mud.	05/12/22	JL	A	Agree. will revise it accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.035	9.1.6 - Ground Monitoring, ¶1-1	JF	03/17/22	Replace "completed" with "performed" If it is recurrent it may be on-going and never be "complete"	05/12/22	JL	A	Agree. will revise it accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.036	9.1.6 - Ground Monitoring, ¶1-2	JF	03/17/22	In reference to "monitor" - Use imperative mood throughout subsection	05/12/22	JL	A	Agree. will reword as follows "Where possible, the groundwater levels must be monitored in each borehole. If accurate... obscures groundwater levels, a secondary shallow hole must be drilled next to the (primary) borehole... Upon completion... both boreholes must be backfilled with cement grout..." ... "Piezometers, multilevel piezometers, monitoring wells, and pumping wells must be installed at selected locations..., and permeability testing must be conducted."		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.037	9.1.6 - Ground Monitoring, ¶1-3	JF	03/17/22	Revise to read as follows: "If accurate groundwater levels cannot be measured at the time of drilling because the use of drilling mud obscures groundwater levels, it may be appropriate to drill a secondary.." Suggest this not be mandatory for all borings. With utility clearances and traffic control requirements a second boring may be more costly than it is worth	05/20/22	MJW	A	Agree. Sentence will be deleted. However, this triggers several revisions critical for monitoring groundwater. First, we will require that groundwater monitoring capability be installed at all boreholes. Considering the litigation risk that groundwater has posed to other infrastructure in the vicinity, we will mandate that standpipe piezometers or vibrating wire piezometers be installed at any borehole drilling opportunity, unless there is already a groundwater monitoring device available within 100 feet horizontally and 25 feet vertically.		08/05/22	BCC	Sentence is still there and none of the proposed text is currently included.	09/02/22	MJW	Text modified and updated in "Groundwater Monitoring" section.	10/03/22	CC
GEC.038	9.1.9 - Laboratory Testing, ¶3-2	JF	03/17/22	Revise to read as follows: "Cerchar Abrasivity Index Soil abrasion testing (ASTM D7625) must also be conducted in units that classify as sands or gravels." Suggest not using European standards.	05/12/22	MJW	A	Will add 'Cerchar Abrasivity Index Soil abrasion testing (ASTM D7625)' and leave as an option for either testing.					8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.039	9.1.9 - Laboratory Testing, ¶4-1	JF	03/17/22	Replace "density, porosity, " with "unit weight"	05/12/22	JL	A	Agree. will revise it accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.040	9.1.9 - Laboratory Testing, ¶6-2	JF	03/17/22	Remove second sentence	05/20/22	MJW	B	Disagree. This is geared to a design-build framework and it is important that the TJPA indicate that this is the designer's responsibility, not that of the TJPA.					8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.041	9.1.9 - Laboratory Testing, ¶6-3,4	JF	03/17/22	Revise to read as follows: "Rock abrasion testing using the Cerchar Abrasivity Index test (ASTM D7625) must may also be conducted. Mineralogy and petrographic analysis, and must be evaluated for each rock type. Representative samples of rock identified as containing asbestiform must be submitted for X-ray diffraction testing to evaluate for the presence of asbestos fibers."	05/20/22	MJW	A	Agree to add the option for Churcher testing but will not remove the option for SINTEF. As this will be procured design-build this must be left to the designer to select based on the preference of their tunnel contractor.					8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 09, Geotechnical Requirements*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Marguerite Bello (Design Team)	MB	Jim French (Design Team)	JF
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
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Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Meghan Murphy (PMPC/AECOM)	MM
Amanda Kaku (PMPC/HCI)	AK		

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
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GEC.042	9.2 - Geotechnical Reporting (Geotechnical Data Report), Fifth bullet	JF	03/17/22	Remove "with offset from profile centerline following the format of the Caltrans Log of Test Borings" Stick-log profiles have been presented but not in LOTB format	05/20/22	MJW	A	Agree to remove the "following the format of the Caltrans Log of Test Borings" but we do want to see the station and offset information on the fence diagram.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.043	9.2 - Geotechnical Reporting (Geotechnical Interpretive Report), Tenth bullet	JF	03/17/22	Revise to read as follows: "Evaluation of ground deformations that may be caused by excavations, and the impacts of this on existing adjacent structures"	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.044	9.2 - Geotechnical Reporting (Memoranda), ¶1	JF	03/17/22	Remove first paragraph - not needed as a deliverable?	05/20/22	MJW	B	Disagree. We want the DB team or the preliminary engineering team to compile this document. That way all the reference geotechnical reports even tangentially related or available or relevant for the project are captured in one body of work.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.045	9.2 - Geotechnical Reporting (Geotechnical Baseline Report), ¶1-2	JF	03/17/22	Revise sentence to read as follows: "The GBR will serve as a summary.."	05/20/22	MJW	B	Standard is to write the DCM in the present tense.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.046	9.3 - Gound Improvement Methods, ¶2-2	JF	03/17/22	Revise to read as follows: "Proposed analytical and design methods for these specialized techniques must be submitted for approval by the TJPA.	05/12/22	JL	A	Agree. will revise it accordingly.	08/05/22	BCC	Editorial: The sentence in the DTX Design Criteria Rev Book 02 - Draft Final has an extra period (punctuation).	09/01/22	JL	checked no extra period in the sentence.	10/03/22	CC
GEC.047	9.3 - Gound Improvement Methods, ¶4-1	JF	03/17/22	Revise to read as follows: "..temporary unless demonstrated to be capable of performing throughout the project design life and accepted by the TJPA."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.048	9.4 - Excavation Base Stability, ¶2-3	JF	03/17/22	Revise to read as follows: "Achieving this factor of safety may require groundwater lowering by dewatering, use of relief wells, or ground improvement below the excavation subgrade to increase the soil strength and resistance against uplift, or a combination of these methods."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.049	9.5 - Groundwater Control, ¶1-1	JF	03/17/22	Revise to read as follows: "..lowering the groundwater, where necessary.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.050	9.5 - Groundwater Control, ¶1-3	JF	03/17/22	Revise to read as follows: "The potential extent of groundwater drawdown around the site caused by dewatering of the site must be.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.051	9.5 - Groundwater Control, ¶2-1	JF	03/17/22	Revise to read as follows: "The necessary tests must be performed to evaluate the anticipated quality and quantity of groundwater to verify that the discharge will meet the San Francisco Public Utilities Commission's (SFPUC) criteria for disposal of groundwater from dewatering into the sewer system." Use imperative mood ("design")	05/12/22	JL	A	Agree. will revise it accordingly. Also, the last sentence of the paragraph will be reworded as follows, "If necessary, on-site treatment must be designed to improve the quality of the discharge to meet the SFPUC criteria for disposal in the sewer system."	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.052	9.6 - Instrumentation and Monitoring, ¶1, first bullet	JF	03/17/22	In reference to "the project area" - Is "the project area" defined in another chapter? It probably should be defined in this chapter (first occurrence in §9.1.6).	05/12/22	JL	A	To be revised by PMPC Team	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.053	9.6 - Instrumentation and Monitoring, ¶4-2	JF	03/17/22	Revise to read as follows: "..must be designed to employ at least two independent measurements.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.054	9.6 - Instrumentation and Monitoring, ¶5-1	JF	03/17/22	Revise to read as follows: "..refer to Specification Section 31 09 13.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.055	9.6.2 - Ground Movement Measuring Devices (Surface Movement Markers), ¶1-3	JF	03/17/22	Revise to read as follows: "..is used to detect settlements that may be masked by the bridging.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.056	9.6.2 - Ground Movement Measuring Devices (Inclinometers), ¶1-2	JF	03/17/22	Revise to read as follows: "Inclinometers may be attached to boreholes, the reinforcing cages of walls, or the soldier beams.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.057	9.6.2 - Ground Movement Measuring Devices (Optical Surveys), ¶1-2	JF	03/17/22	Revise to read as follows: "Optical surveys are used to monitor the vertical and horizontal movement of.."	05/12/22	JL	A	Agree. will revise it accordingly.	08/05/22	BCC	Editorial: The sentence in the DTX Design Criteria Rev Book 02 - Draft Final has an extra period in middle of sentence (punctuation).	09/01/22	JL	Removed the extra period in the middel of the sentence.	10/03/22	CC
GEC.058	9.6.3 - Monitoring Schedules, ¶1-3	JF	03/17/22	Revise to read as follows: "..as dataloggers with remote communication capabilities, must be collected no less frequently than once per hour."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.059	9.6.4 - Deformation Trigger Levels, ¶2-1	JF	03/17/22	Replace "will" with "must" and "deformation" should be pluralized	05/10/22	MJW	A	To be revised by PMPC Team	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.060	9.2 - Geotechnical Reporting (Geotechnical Interpretive Report), Fourth bullet	MB	03/03/22	Maximum and minimum, including expected floods, tides, and sea level rise, etc.	05/20/22	MJW	A	An additional bullet can be added indicating the hydraulic design inputs received for geotechnical consideration, such as flood elevation, tidal variation, and sea level rise (cannot put "etc." in a list, either have to be exhaustive of what we want or not at all). But these parameters are defined by other disciplines, not by geotechnics.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.061	9.2 - Geotechnical Reporting (Geotechnical Interpretive Report), Ninth bullet	MB	03/03/22	Including pile capacities (flexural, shear, deformations) and stiffnesses, for compression and tension loads	05/20/22	MJW	B	Agree that these would be provided in a GIR document. However, this level of specificity is not consistent with the other items in the list. Commentator's requested pile capacities are required by other design requirements such as the California Building Code or AASHTO HDM 8 with Caltrans Amendments, or the standard of care for geotechnical deliverables. As this interface would be a request between the design-builder's geotech an structural designers, no change proposed.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.062	Chapter 9	SMi	09/12/16	LEGACY Comment GEC16.046 - Should this section include the geotechnical design criteria for foundations, support of excavation, underpinning, and soil-structure interactions, etc.?	05/04/22	AG	C	Per the Scope section (pg. 9-1): "This chapter does not provide specific design parameters. Because of the variability in ground conditions along the DTX alignment, the design parameters have been developed from site-specific subsurface investigations and laboratory testing programs. The geotechnical data and design parameters are presented in the geotechnical reports referenced herein."		ROK					05/04/22	CC
GEC.063	Section 9.1	PC	09/12/16	LEGACY Comment GEC16.047 - First bullet item: Boreholes (Standard Penetration Tests, SPT)	05/04/22	AG	A	Added.		ROK		05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.064	Section 9.2	SM	09/12/16	LEGACY Comment GEC16.048 - It should be clearly stated what the differences and usages of GDR, GBR and GRR are with regard to the contract document hierarchy. Detailed requirements and contents of the GBR shall be added. It says "A GBR shall be prepared for the mined tunnel~". Should the GBR be prepared for the entire project alignment? Please clarify this. Please specify the recommendations from ASCE/SME. Are these referring to "Geotechnical Baseline Reports for Construction – Suggested Guidelines (Essex, 2007)?	05/04/22	AK	C	Will add descriptive language for each of the reports. As a note, "GRR" is now referred to as the "GIR." Regarding the GBR: The limits will be determined based on the contract package strategy selected at a later time.		ROK					05/04/22	CC

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Document date:	*2/28/2022*		

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Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
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GEC.065	Section 9.4	PC	09/12/16	LEGACY Comment GEC16.049 - This section is ok and very general. Knowing how sensitive the ground condition is north of the SEM section, I am wondering if we should limit global dewatering in certain section.	05/04/22	MJW	A	DCM to be updated to reflect a damage criterion associated with groundwater management.		ROK		05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.066	Section 9.5	PC	09/12/16	LEGACY Comment GEC16.050 - Is there a specific threshold design table that TJPA want to follow? We should clearly refer to the table (assume it will be in Ch. 10) as design criteria at the end.	05/04/22	AK	A	The design of the geotechnical instrumentation used in the project is specified in the project specifications, Section 31 09 13. A reference to this section will be added in the Design Criteria.		ROK		05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.067	Section 9.2	SMi		LEGACY Comment GEC18.040 - It should be clearly stated what the differences and usages of GDR, GBR and GRR are with regard to the contract document hierarchy. Detailed requirements and contents of the GBR shall be added. It says "A GBR shall be prepared for the mined tunnel~". Should the GBR be prepared for the entire project alignment? Please clarify this. Please specify the recommendations from ASCE/SME. Are these referring to "Geotechnical Baseline Reports for Construction – Suggested Guidelines (Essex, 2007)?	05/04/22	AG	C	Repeat of 2016 comment #48.		ROK						
GEC.068	DC 9.2	PC		LEGACY Comment GEC18.041 - GBR: Do we limit the preparation of GBR to only mined tunnel? Or we should include cut and cover tunnel including station and vent shafts, etc. GRR: Should we change the terminology of GRR to GIR (Geotechnical Interpretive Report) to be consistent with what we have (see DC 4.8.1)?	05/04/22	AK	A	GBR: Similar comment to GEC16.048. GRR: Yes. Will change references to GRR to GIR.		ROK		05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.069	Sect. 9.2, GRR	YS		LEGACY Comment GEC18.042 - Please clarify that in the GRR, parameters for design of tunnel support in rock such as joints and discontinuities orientation and spacing, strength, and bond strength of soil nail and rock anchor design should be provided.	05/04/22	AK	C	The GRR is now known as GIR; it does not include design recommendations for the mined tunnels, but instead provides recommendations for soil properties to be used as a basis for the design. More details are provided in the design memorandum by Jacobs on numerical analysis of tunnel excavation and support methods, Task No. 7.03, dated February 18, 2010.		PAR	The rock mass parameters for mined tunnel design are derived by MJA in its ground characterization TM. But MJA still needs guidance from Wood on the properties of rock discontinuities as stated in the comment.	05/20/22	MM	This is a design team coordination issue, no edits required to the design criteria.	05/20/22	CC
GEC.070	DC 9.3	PC		LEGACY Comment GEC18.043 - Suggest adding "compensation grouting" to one of the techniques.	05/04/22	AG	A	Added.		ROK		05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.071	Sect 9.5.4, 2nd paragraph	YS		LEGACY Comment GEC18.044 - It is a common practice that the trigger levels are specified on contract drawings instead of in specifications. Suggest changing "specifications" to "contract documents".	05/04/22	AG	A	Revised.		ROK	No additional comment	05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.072	Chapter 9 Header	KB	08/03/22	Geotechnical' is misspelled in the header on each page with the 'n' and 'i' flipped.	09/01/22	JL	A	Editorial – PMPC Team will update.				09/02/22	MJW	I did a replace all of "geotechincal" for "geotechnical" and found one instance.	10/03/22	CC

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HSR.001	9.1.1 - 3rd bullet	MF	03/30/22	CA HSR will not allow rotasonic drilling in soil as this drilling method retrieves a continuous but highly disturbed sample allowing only index lab testing. Rot sonic is not appropriate for most soil conditions except unconsolidated gravels and cobbles which are not anticipated in downtown SF.	05/20/22	MJW	B	Agree with the reviewer that the resulting sample is highly disturbed and not useful for laboratory testing that requires undisturbed samples. However, the method has advantages in its ability to advance through rubble-laden fill material, intermediate geomaterial, or soils typical of the vicinity to procure larger volumes of soils for tunnel abrasivity testing or environmental characterization. The methods of drilling must be left up to the design builder and the DCM permits TJPA to comment on the work plan if a designer proposes using vibracore-procured samples for undisturbed testing.	06/27/22	ROK	Ok	05/20/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/20/22	CC
HSR.002	Chap 9 - Geotechnical Requirements	MF	03/30/22	Many other geotechnical aspects are not discussed in this chapter, for instance settlement, foundation, earthwork criteria.	05/20/22	MJW	C	Agree with the reviewer's comment. These are provided as standard of care and required by governing codes and standards. Repeating the requirements would potentially create conflicts with those codes.	06/27/22	ROK	Ok				05/20/22	CC
HSR.003	Chap 9 - Geotechnical Requirements	MF	03/30/22	A cross reference to Chap 11 should be included as there are several geotechnical related requirements discussed in Chap 11 - groundwater, lateral earth pressures, excavation support and underpinning.	05/20/22	MM	A	To be revised by PMPC team if a reference to Chapter 11 should be included in, say, the introduction including "Attention is drawn to additional provisions of geotechnical seismic design identified in Chapter 13, and other areas of the DCM."	06/27/22	ROK	Ok	05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
HSR.004	9.1.1.	MF	03/30/22	Shear wave velocity needs to be collected to sufficient depth to establish a reference horizon for site response analysis required by Chapter 13 - Seismic. Consider whether guidance or requirements related to depth and frequency of shear wave velocity measurements in order to obtain adequate ground motions for the project.	05/20/22	MJW	A	Agree. Will modify §9.1.7 in accordance with other comments and this to include requirement that, " Shear wave and P-wave velocity information must be collected to adequate depth to establish a reference horizon."	06/27/22	ROK	Ok	05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC

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Cal.001	Chapter 9	JP	04/29/22	experience qualification for the geotechnical engineer of record	05/20/22	MJW	A	GEOR will require approval by the TJPA who will establish the experience qualifiers				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.002	Chapter 9	JP	04/29/22	(bullet) FHWA Geotechnical Technical Guidance Manual (GTGM), 2007	05/20/22	MJW	A	Agree, will add GTGM, 2007				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.003	Chapter 9.1	JP	04/29/22	include; , depth,	05/20/22	MJW	A	Will revise first sentence of second paragraph to read as follows: "The number, depth, and locations of…"				05/20/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.004	Chapter 9.1.1	JP	04/29/22	capitalize; Cone Penetration Tests	05/16/22	AK	A	To be revised by PMPC Team	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
Cal.005	Chapter 9.1.1	JP	04/29/22	(bullet) Soil Resistivity	05/20/22	MJW	C	This is covered by the sentence requiring corrosion testing near the end of 9.1.9. But can also add downhole e-logging to 9.1.7, as a permissive and modify the title "for modulus determination" to "for modulus or resistivity determination"							05/20/22	CC
Cal.006	Chapter 9.1.2	JP	04/29/22	revise; 'alternative sampling techniques must'	05/20/22	MM	A	Revised to read: "..alternative soil sampling techniques must be used instead of coring..".				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.007	Chapter 9.1.3	JP	04/29/22	with label; horizontal and vertical locations where core was taken, date, etc.	05/20/22	MJW	A	Agree, will include requirement that core boxes be labeled with this information.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.008	Chapter 9.1.9	JP	04/29/22	include; GTGM,	05/20/22	MJW	B	Disagree. This section refers to test method standards/procedures. While the GTGM refers test standards, it does not specify test procedures.				05/20/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.009	Chapter 9.2	JP	04/29/22	approved by geotechnical engineer of record	05/20/22	MJW	A	Not sure to which document this refers, but a requirement will be added that the GIR, calculation memoranda, and GBR must be stamped by the GEOR.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.010	Chapter 9.2	JP	04/29/22	(bullet) evaluation of in service performance of new structure(s) under predicted standard operations	05/20/22	JL	C	Not sure which section the reviewer is considering for the bullet item; don't think it fits into Section 9.2. Geotechnical Reporting. Please clarify.							05/20/22	CC
Cal.011	Chapter 9.2	JP	04/29/22	clarify; GIR includes 'all design parameters' which is contradictory	05/20/22	MM	A	Will revise and remove the word "all".				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.012	Chapter 9.4	JP	04/29/22	Basal Heave; subheading and number	05/20/22	JL	A	will revise 9.4 Excavation Base Stability as follows. "9.4 Excavation Base Stability Basal heave and hydrostatic analysis must be conducted for excavations for temporary and permanent facilities. 9.4.1 Basal Heave The evaluation of excavation stability against basal heave... ... and approved by the TJPA. 9.4.2 Hydrostatic Uplift The stability of the base of the excavation against hydrostatic uplift... ... and resistance against uplift."				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.013	Chapter 9.4	JP	04/29/22	Hydrostatic Uplift; subheading and number	05/20/22	JL	A	See the response to Cal.012 above.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.014	Chapter 9.4	JP	04/29/22	move geotechnical and TJPA approval to last sentence	05/20/22	JL	A	See the response to Cal.012 above. The sentence is now the last sentence of Section 9.4.1.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.015	Chapter 9.4	JP	04/29/22	reference standard or guideline used for factors of safety	05/20/22	JL	A	will add references as follows. "... Factors of safety against basal heave must not be less than 1.5 (e.g., Clough and O'Rourke, 1990),... " and "... The minimum factor of safety against hydrostatic uplift will be 1.3 (e.g., Bowles, 2001)." will add the following reference in the reference section. "Bowles, J.E. (2001). Foundation Analysis and Design, McGraw-Hill, USA." Clough and O'Rourke (1990) is already listed in the reference section so no need to add it.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.016	Chapter 9.5	JP	04/29/22	include; from dewatering	05/20/22	MM	C	Dewatering is included in this section.							05/20/22	CC
Cal.017	Chapter 9.6	JP	04/29/22	(bullet) monitor post construction service performance	05/20/22	JL	A	will add the fifth bullet point "Monitor post-construction performance"				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.018	Chapter 9.6	JP	04/29/22	refer to design parameters established in section 10.2	05/20/22	JL	C	Not sure what the reviewer is referring to for referencing.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.019	Chapter 9.6.1	JP	04/29/22	define for clarity	05/20/22	JL	C	Not sure what the reviewer is referring to for clarity.							05/24/22	CC
Cal.020	Chapter 9.6.2	JP	04/29/22	TJPA approval	05/20/22	MM	A	Agree, will add "and as approved by TJPA" to the end of the introductory sentence.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.021	Chapter 9.6.4	JP	04/29/22	and associated design parameter, reference section 10.2	05/23/22	MM	A	Agree.				05/23/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/23/22	CC
Cal.022	Chapter 9.6.4	JP	04/29/22	TJPA approval	05/20/22	MM	A	Agree, will add "and as approved by TJPA" to the end of section.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.023	Chapter 9; (Page 9-3 of 13)	JP	07/12/22	Project-Specific Reference Documents; include: -Parsons; geotechnical reports -Slate; Seismic Hazard Analysis	09/02/22	MJW	C	Final Geotechnical Interpretive Report by Parsons (2010) is included in the reference list. Slate's seismic hazard analysis report is not needed as reference for this geotechnical section.				09/02/22	MJW	Reference to Slate's seismic hazard analysis added to seismic section, no change required, therefore comment is considered closed	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 104
Comments Closed 104
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 09, Geotechnical Requirements*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Marguerite Bello (Design Team)	MB	Jim French (Design Team)	JF
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Meghan Murphy (PMPC/AECOM)	MM
Amanda Kaku (PMPC/HCI)	AK		

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DE – Designer to evaluate

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ROK – response okay
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BRS - Back-check Response Status
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OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
TA.001	Section 9.1.1, Soil Explorations (first para)	LZ	07/04/22	States that "sampling may be increased", but the increase is in the distance between samplings, not the samplings themselves. should say that" sampling may be reduced"	09/01/22	JL	A	Agreed. revised the sentence as follows. Sampling frequency may be reduced generally to once every 10 feet and at layer changes outside of the tunnel horizon, defined as the tunnel section, and one diameter above and below the tunnel.				10/03/22	MJS	The responder (PMPC Team) agreed and addressed the original comment therefore it is considered closed.	10/03/22	CC
TA.002	Section 9.1.1, Soil Explorations (secondpara)	LZ	07/04/22	It says that a secondary monitoring hole "may be appropriate" and then says that a shallow hole "must be" drilled. Please clarify	09/01/22	JL	A	Revised as follows. it may be appropriate to drill a secondary shallow hole next to the (primary) borehole where sampling is being performed and...				10/03/22	MJS	The responder (PMPC Team) agreed and addressed the original comment therefore it is considered closed.	10/03/22	CC
TA.003	Section 9.6, Instrumentation and Monitoring (second to last para)	LZ	07/04/22	Makes reference to the specifications for additional information, but the Design Criteria forms the basis for specifications, not the other way around	09/03/22	MJW	A	Agree, reference to specification removed to avoid disrupting order of precedence. The revision directs the designers to develop for TJPA review and implement a specification for detailed information regarding the ... It is still unclear if the specifications will be prescriptive or model specs for a PDB team to revise and implement. This will have to be reconciled at final issue.				10/03/22	MJS	The responder (PMPC Team) agreed and addressed the original comment therefore it is considered closed.	10/03/22	CC
TA.004	Section 9.6.1, Groundwater Measuring Devices	LZ	07/04/22	It is titled Groundwater Measuring Devices, but also includes Ground Movement Measuring Devices. Either change the section title or create a separate sectiom	09/01/22	JL	A	Revised the title to Groundwater/Ground Movement Measuring Devices.				10/03/22	MJS	The responder (PMPC Team) agreed and addressed the original comment therefore it is considered closed.	10/03/22	CC
TA.005	Section 9.6.1, Groundwater Measuring Devices (Optical Surveys)	LZ	07/04/22	Optical Surveys is misspelled	09/01/22	JL	C	Checked the spelling of optical surveys is correct in the section.				10/03/22	MJS	The responder (PMPC Team) agreed and addressed the original comment therefore it is considered closed.	10/03/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**70**
Comments Closed	**70**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 10, Seismic Design*		
Document date:	*3/18/2022*		

Reviewers			
Name	Initials	Name	Initials
J. Gebelein (Design Team)	JG	E. Qi (Design Team/ATN-Structus)	EQ
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Henry Chang (Design Team/Structus)	HC	Kimo Okamitsu (Design Team)	KO
Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Fletcher Waggoner (CHSRA)	FW	Luis Zurinaga (SF CTA)	LZ
Responders			
Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Ch10 General	JG	04/08/22	In this updated DTX Design Criteria, the seismic design requirements for building structures and components are less than the minimum seismic performance requirements set forth by CalTrain and California HSR. Since CalTrain and HSR are using this station, it would seem prudent to at least meet their standards. Reference CalTrain PCJPB Standards for Design and Maintenance of Structures, Chapter 4: Seismic Design, dated August 31, 2020 and CHSRA Design Criteria Manual, Chapter 30: Seismic, notably 30.2.2 Seismic Performance Objectives, dated September 21, 2021. (The DTX appears consistent with CalTrain and HSR for underground work, this comment is for the other structures and components on the project)	05/20/22	JL/MM	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	Ch 10, General	YS	04/08/22	Should this be Chapter 13 instead of 10? If so, please make changes in the entire chapter.	05/09/22	MJS	C	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.				05/13/22	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.003	Ch10 General	EQ	04/08/22	Please confirm that the performance objectives for each earthquake level presented in Chapter 2, Owner's requirements remain unchanged as we have not received the revised Chapter 2 yet. Should FEE earthquake level be considered in serviceability limit state such as checking crack width/control per section 11.2.2 of Chapter 11 - Structures?	05/24/22	MM	A	PMPC Team has removed duplicate information from Chapter 2 that is discussed in detail in relevant chapters (in this case, Chapter 10, Seismic Design).	05/24/22	ROK		05/24/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/24/22	CC
GEC.004	Ch 10, Page 13-2 of 12	YS	04/08/22	Update Parsons' GDR and GIR with the newer revisions.	05/09/22	MJS	A	References to the design team's GDR and GIR have been updated to latest versions.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.005	Ch10.1 Seismic Hazard	JG	04/08/22	Do the requirements to perform peer-reviewed seismic hazard assessments and directivity modeling apply to surface structures designed per the building code? This section does not indicate what items it applies to.	05/13/22	JL	A	They also apply to surface structures per building code. It was revised to clarify this accordingly.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.006	Ch10.1, Page 13-4 of 12	EQ	04/08/22	It should read "Also, the upper 30-meter (time) averaged shear wave velocity…". The word "time" should be deleted.	05/13/22	JL	A	it is "time-averaged" shear wave velocity by the definition per ASCE7 and other significant literatures, which is a frequently used term for Vs30. A hyphen will be added between time and averaged. PMPC technical editor to address as noted				05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC
GEC.007	Ch10.10 Peer Review	JG	04/08/22	Says "peer reviews must conform to the … requirements in the … CBC". There are no requirements in the CBC for peer reviews. Please clarify what the reference to the CBC is intended to mean.	05/13/22	JL	B	Section 1617.11.1 - 1.3.8 of CBC refers to Section 322 peer review requirements of the California Existing Buildings Code. We specified the section of CBC.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	Ch 10.2.1, Title, Page 13-5 of 12	YS	04/08/22	Change the section title to "Design Ground Motion Time Histories at Reference Horizon"	05/13/22	JL	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.009	Ch 10.3.1, 1st Para., Page 13-7 of 12	YS	04/08/22	Suggest re-evaluating the requirement for not allowing load sharing in final lining design.	05/13/22	DP/JL	C	See response to comment HSR.018 in Section 13, Tunnels.							05/13/22	CC
GEC.010	Ch10.3.1, Page 13-6 of 12	EQ	04/08/22	Peer-review should be in conformance with subsection 10.10, **not 13.10**?	05/09/22	MJS	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.011	Ch10.3.1, Page 13-6 of 12	EQ	04/08/22	It should read "… ingress of flowing ground (water) …" Missing word "water".	05/09/22	MJS	A	Revised as follows: "..ingress of flowing groundwater.."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.012	Ch10.3.3, Page 13-7 of 12	EQ	04/08/22	Typo: it should be section 10.3.1, not 13.1.1.	05/09/22	MJS	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.013	Ch10.3.3, Page 13-7 of 12	EQ	04/08/22	It is not clear if the design criteria of "displacement ductility ratio of 1.5 must be acceptable" is a demand or capacity requirement. Please clarify. Suggest to change "must" to "may be". Please confirm that under the SEE earthquake, maximum displacement ductility ratio of 1.5 is allowed.	05/13/22	NLV	A	Agreed. Changed "[...]ratio of 1.5 must be [...]" to ""[...]ratio of 1.5 may be [...]".	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.014	Ch10.3.3, Page 13-7 of 12	EQ	04/08/22	"Shear capacities of concrete structures and structural components must be designed for the strength demands…". Please clarify if shear capacities shall be designed to exceed the shear based on the expected flexural strength of the member (capacity design approach).	05/13/22	NLV	DE	Will clarify. Members should be designed to capacity protect against the shear limit state.	08/05/22	BCC	Several "DE" responses were acceptable to PMPC but may not provide the Design Team with clear direction.	09/02/22	NLV	Added sentence to specify overstrength shear be used in seismic critical members as per Caltrans SDC.	09/02/22	CC
GEC.015	Ch10.3.3, Page 13-7 of 12	EQ	04/08/22	Table 10-1 Allowable Strains. Please clarify at what compressive strain, concrete will be confined. Please confirm that the allowable strains limits are compatible with the maximum allowable displacement ductility ratio of 1.5 (under SEE event).	05/13/22	NLV	DE	Will evaluate.	08/05/22	BCC	Several "DE" responses were acceptable to PMPC but may not provide the Design Team with clear direction.	09/02/22	NLV	Table edited to match CHSRA strain limits, which will work with Caltrans SDC.	09/02/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**70**
Comments Closed	**70**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 10, Seismic Design*		
Document date:	*3/18/2022*		

Reviewers			
Name	Initials	Name	Initials
J. Gebelein (Design Team)	JG	E. Qi (Design Team/ATN-Structus)	EQ
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Henry Chang (Design Team/Structus)	HC	Kimo Okamitsu (Design Team)	KO
Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Fletcher Waggoner (CHSRA)	FW	Luis Zurinaga (SF CTA)	LZ
Responders			
Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.016	Ch10.3.3, Page 13-8 of 12	EQ	04/08/22	"Expected concrete compressive strength in a seismic event". Which seismic event? SEE event?	05/13/22	NLV	C	Both events/any events considered. Clause is giving minimum f'ce to be used in design.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.017	Ch10.3.5, Page 13-8 of 12	EQ	04/08/22	Please clarify if flexible connection must be used between any two structures with drastically different stiffness/mass **(or, and)** in poor ground condition. How is it considered "drastically different"?	05/13/22	NLV	DE	Will evaluate to determine a better definition of "drastically different stiffness/mass".	08/05/22	BCC	Several "DE" responses were acceptable to PMPC but may not provide the Design Team with clear direction.	09/02/22	NLV	"Drastically different" has been defined in new equation.	09/02/22	CC
GEC.018	Ch10.4.4, Page 13-9 of 12	EQ	04/08/22	Please clarify "The factor of safety for sliding during the SEE event must be estimated but must not control the design".	05/05/22	JL	A	The sentences immediately followed clarify that permanent displacements during the SEE event must be estimated if the FS less than 1.0. We improved the clarity of the sentences.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.019	Ch10.4.4, Page 13-9 of 12	EQ	04/08/22	Please clarify "Do not consider solid bearing pressure for seismic loads for preliminary design".	05/05/22	JL	A	Revised this with clarification				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
GEC.020	Ch10.7 Buildings and Surface Facilities	JG	04/08/22	Specify what the minimum required Risk Category is for the design of surface structures. The referenced codes could be interpreted to have a much lower category than would be appropriate for the intended use and seismic performance, so it must be explicitly stated. Indicate which facilities are considered essential for operations. Conform with CalTrain/HSR requirements.	05/20/22	JL/MM	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM. Risk definitions are included in the Threat and Vulnerability Assessment and are outside of the scope of this document.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.021	Ch10.7 Buildings and Surface Facilities	JG	04/08/22	Indicate any restrictions on seismic lateral force resisting systems for essential structures. Conform with CalTrain/HSR requirements.	05/20/22	JL/MM	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.022	Ch10.7 Buildings and Surface Facilities	JG	04/08/22	Indicate the analysis requirements for seismic design of surface facilities that are supported on the below grade structure, such as station entrances. The referenced codes and standards do not clearly cover this condition, and it should not be left open to interpretation.	05/20/22	JL	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.023	Ch10.8 Non-structural Components	JG	04/08/22	Section 10.7 says conform to the CBC and ASCE 7-22; but 10.8 says only the CBC which the current edition uses ASCE 7-16. Please clarify if we are using two different versions of ASCE 7, or if 10.8 should also use ASCE 7-22	05/24/22	MM	A	Revised as noted	05/24/22	ROK		05/24/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/24/22	CC
GEC.024	Chapter 13	PC	09/12/16	LEGACY Comment GEC16.081 - OBE design event?	05/20/22	JL	A	AASHTO LRFD Tunnels will now govern the design earthquake types: Safety evaluation earthquake (SEE) and functionality evaluation earthquake (FEE) will be defined in Rev Book 02	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.025	Chapter 13	PC	09/12/16	LEGACY Comment GEC16.082 - Should we list the ground motion time histories be used for design in this , or you prefer to keep those in geotechnical documents.	05/20/22	AK	C	It is preferred to reference the geotechnical documents as to not duplicate information across more than one document.		ROK					05/04/22	CC
GEC.026	Page 13-1 of 10	HC	09/12/16	LEGACY Comment GEC16.083 - Under the sub-heading of OBE: Please provide Criteria for OBE.	05/20/22	AK	C	The performance objectives for OBE are in Section 2.6 of the Design Criteria Manual.		ROK					05/04/22	CC
GEC.027	Page 13-1 of 10	HC	09/12/16	LEGACY Comment GEC16.084 - Under the sub-heading of Codes, Standards and Guidelines: Please confirm if latest codes and standards should be used instead of older versions. For example, the latest version of Caltrans Memo to Designers 20-1 is 2010 instead of 1999 listed. Uniform Building Code 1997 is referenced but not used by practitioners nowadays.	05/20/22	AK	A	Will check specific criteria listed to confirm most current information is being used. Will remove reference to UBC code.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.028	Page 13-2 of 10	HC	09/12/16	LEGACY Comment GEC16.085 - Under the sub-heading of "References": Please clarify if the latest version of BART Facilities Standards, BFS 3.03 (2016) should be referenced instead of the 2004 version.	05/20/22	AK	A	Will check specific criteria listed to confirm most current information is being used.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.029	Section 13.4.4 Page 13-8 of 10	HC	09/12/16	LEGACY Comment GEC16.086 - Under the sub-heading of 13.4.4, "Overturning": Please clarify if there is a factor of safety for OBE and for MDE.	05/20/22	NLV	B	B/6 is the maximum eccentricity allowed per AREMA.		PAR	Please clarify if the overturning check will be performed for both OBE and MDE? If so, what is the Safety Factor is for each load combination involved OBE and MDE?	05/13/22	JL	Clarified - The maximum eccentricity was specified for overturning check.	05/13/22	CC
GEC.030	Sect. 13	YS		LEGACY Comment GEC18.088 - Based on MJA's experiences from other projects which potentially affect existing structures such as a highway superstructures, the owner such as Caltrans of the existing structures could require the evaluation of impact of their seismic design earthquake used for those structures. For example, should Caltrans have used a return period of 2500 yr. for their superstructure design, DTX might have to consider that return period for the tunnel section which could be considered to have an impact. So special circumstances might exist.	05/20/22	NLV/MJS	A	Need to discuss with TJPA. (MJS) Slate geotechnical is developing a ground motions study to determine project wide applicable design return period. Special cases will need to be reviewed and approved by the TJPA.		PAR	Will review the final decision from TJPA on this issue.	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 70
Comments Closed 70
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 10, Seismic Design*		
Document date:	*3/18/2022*		

Reviewers			
Name	Initials	Name	Initials
J. Gebelein (Design Team)	JG	E. Qi (Design Team/ATN-Structus)	EQ
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Henry Chang (Design Team/Structus)	HC	Kimo Okamitsu (Design Team)	KO
Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
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GEC.031	Sect. 13	YShi		LEGACY Comment GEC18.089 - Provide OBE criteria (currently noted as "Criteria in abeyance").	05/20/22	AK	C	Same as comment GEC16.083.	05/13/22	ROK	No further comment.				05/04/22	CC
GEC.032	Sect. 13	KO		LEGACY Comment GEC18.090 - Recommend revising ODE and MDE criteria as follows (consistent with Westside): ODE: A return period of 150 years (50% probability of exceedance in 100 years) is used to establish the ODE. MDE: A return period of 2500 years (4% probability of exceedance in 100 years) is used to establish the MDE.	05/20/22	JL	C	A return period of 975 years is used for Safety Evaluation Earthquake (SEE) or MDE, which is consistent with similar high-profile projects in the Bay Area including Central Subway, CHSRA, and Caltrans' SDC.	05/04/22	ROK					05/04/22	CC
GEC.033	Sect. 13.1	YS		LEGACY Comment GEC18.091 - Site classes along the alignment should be updated to reflect the proposed changes in the alignment and excavation methods.	05/20/22	AK	A	Site classes are currently referencing the National Earthquake Hazards Reduction Program (NEHRP) site classifications. The site class categories will be modified based on changes to the alignment and excavation methods as applicable.	05/13/22	ROK	No further comment.	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.034	DC 13.1	PC		LEGACY Comment GEC18.092 - We need to update these sections. I assume the site classes may stay the same, but the descriptions will change.	05/20/22	AK	A	Will be updated. Similar to comment GEC18.092.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.035	DC 13.2	PC		LEGACY Comment GEC18.093 - The reference to Arup will be revised.	05/20/22	AK	A	Revised as noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.036	Sect. 13.3, 1st sentence	YS		LEGACY Comment GEC18.094 - Change "static" to "dynamic".	05/20/22	AG	A	Revised as noted.	05/13/22	ROK	No further comment.	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.037	Sect. 13.3.1, 3rd paragraph	YS		LEGACY Comment GEC18.095 - The seismic design and analysis techniques should also include those developed by Hashash et al.	05/20/22	AG	A	Added.	05/13/22	ROK	No further comment.	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.038	13.3.2	DMJ		LEGACY Comment GEC18.096 - If conventional strength design is performed including force effects caused by MDE racking displacement (with slabs at Ig and walls at 0.5Ig), including Modified Compression Field Theory design for shear over-strength design for shear is not required	05/20/22	NLV	B	If cross section elements remain elastic when racking displacements of considered earthquake event are applied, overstrength design for shear is not required.	05/13/22	ROK	Response Okay				05/04/22	CC
GEC.039	13.1	AK		LEGACY Comment PMPC.003 - Is using Zone maps from UBC an outdated practice? Need input and guidance from SME to revise this section.	05/20/22	JL	A	UBC Zone was removed.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.040	10.8 Non-Structural Components	JG	08/05/22	The last sentence of paragraph two in certain cases dictates a design that is less than the building code. Please change "Non-essential equipment and equipment supports, and anchorage must be designed using an importance factor of 1.0." to instead read "Non-essential equipment and equipment supports, and anchorage ~~must~~ may be designed using an importance factor of 1.0 where permitted by the refereneed codes."	08/18/22	JL	A	Addressed				09/02/22	NLV	Sentence edited in similar verbiage as suggested edit.	09/02/22	CC
Cal.001	Chapter 10	BZ	04/21/22	reconcile chapter number with section 1.6 Design Criteria Organization; renumber chapter subsection accordingly	05/09/22	MJS	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.002	Chapter 10 - 10.3.1	BZ	04/21/22	check slab structure for cracked condition; 0.5Ig	05/16/22	JL	A/DE	revised as follows. "In the soil-structure analysis, the gross moment of inertia (Ig) must be used if uncracked slabs/walls are considered, and an appropriate fraction of the gross moment of inertia (e.g., 0.5 Ig) must be used if cracked slabs/walls are considered."				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.003	Chapter 10 - 10.3.1	BZ	04/21/22	Proposed joint locations and magnitude of joint opening must be approved by the TJPA and PCJPB.	05/16/22	MM	DE	The governance and approval process between TJPA and PCJPB is being coordinated via the Master Cooperative Agreement. The output of that agreement can be incorporated into the next update of the design criteria.				05/16/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.004	Chapter 10 - 10.1.1	BZ	04/21/22	revise section number	05/09/22	MJS	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.005	Chapter 10 - 10.4	BZ	04/21/22	omit 'generally'	05/09/22	MJS	A	Revised as noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.006	Chapter 10 - 10.4	BZ	04/21/22	include; and AREMA Chapter 8.	05/13/22	JL	DE	will consider including AREMA Ch.8 in the next revision.				05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC
Cal.007	Chapter 10 - 10.9.2	BZ	04/21/22	revise to 'project geotechnical engineer of record'; revise all references to geotechnical engineer accordingly	05/13/22	MM	B	TJPA requires staff to hold a California registrations, 'the California-registered geotechnical engineer' intentionally.				05/13/22	MM	The responder (PMPC Team) will has confirmed that the criteria is compliant with TJPA requirements; therefore this comment is considered closed.	05/13/22	CC
Cal.008	Chapter 10 - 10.9.3	BZ	04/21/22	Slope reinforcement must be approved by the TJPA and PCJPB.	05/16/22	MM	DE	See response to Cal.003.				05/16/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.009	Chapter 10 - 10.10	BZ	04/21/22	revise to 'be approved by the TJPA and PCJPB'	05/16/22	MM	DE	See response to Cal.003.				05/16/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.010	Section 13.6	BZ	10/18/18	LEGACY Comment Cal18.039 - Section 13.6 Bridges (highlighted text - "Caltrans Seismic Design Criteria." For railway bridges, seismic design shall be in accordance with AREMA Chapter 9.	05/20/22	MJS/JL	A	Caltrans Seismic Design Criteria has been included in the "References" section of the chapter. AASHTO LRFD Tunnels will govern seismic design.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.011	Chapter 10 Section 10.3.1; (Page 10-7 of 13)	JP	07/12/22	Load sharing between the temporary construction support and the final lining of the mined tunnel shall be justified by analysis and approved by TJPA prior to NTP for final design. (reference MINED Tunnel Design Preliminary Engineering Technical Memorandum 334.1.1)	08/18/22	DP/JL	C	See Chapter 13, Tunnel comment review log - response to comment Cal.015 and similar comment responses referenced within that response - GEC.010, as well as responses to HSR.018 and HSR.029.				10/03/22	MJS	The responder (PMPC Team) provided references within this CRL that satisfactorilly resolve the inquiry; comment is considered closed.	10/03/22	CC
Cal.012	Chapter 10 Section 10.7; (Page 10-11 of 13)	JP	07/12/22	include San Francisco Building Code	08/18/22	JL	A	Editorial – PMPC Team will update accordingly. (Added text. Did you want the exact code listed? It is not - SL)				09/02/22	NLV	Agree. SFBC added to sentence.	10/03/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**70**
Comments Closed	**70**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 10, Seismic Design*		
Document date:	*3/18/2022*		

Reviewers			
Name	Initials	Name	Initials
J. Gebelein (Design Team)	JG	E. Qi (Design Team/ATN-Structus)	EQ
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Henry Chang (Design Team/Structus)	HC	Kimo Okamitsu (Design Team)	KO
Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
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HSR.001	Chapter 10 - Scope	FW	04/06/22	Apparently this Chapter used to be 13, but now 10. Section 13.1.1: Structural Component Design needs renumbering. This section states "The performance objectives for each earthquake level are presented in Chapter 2, Owner's Requirements." Since Chapter 2 not available to me, I can't review relative to the criteria in this chapter.	05/03/22	JL	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.	06/23/22	ROK	Ok	05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.002	Chapter 10 - Scope	FW	04/06/22	The lower level probabilistic EQ varies in CHSR Criteria where the Operational Basis Earthquake (OBE) has 50-year return period vs. the FEE of 475-year for DTX.	05/19/22	MM	C	DTX vs. CHSRA: •MDE/MCE: The ground motions for DTX and CHSRA are similar, with return periods of approximately 1,000 years. However, the performance criteria for DTX is more stringent than that of CHSRA. •OBE: The ground motions for DTX are higher than that of CHSRA, while the structural performance criteria is relatively the same between the two. In general, the seismic criteria for DTX is more stringent than that of CHSRA. This can be attributed to a few reasons: •DTX only has underground tunnels/structures, which typically perform better than elevated structures (bridges). Therefore, designing tunnels for a higher seismic performance does not come at the same high cost premium as it does for elevated structures. •For the OBE, the ground motions for CHSRA are much lower than DTX. This is because the tolerances required by CHSRA to run trains in excess of 200 mph are extremely tight, and designing for these tolerances using a large seismic event is impractical. In contrast, the DTX speeds are much lower (40 mph max) and so the higher ground motions don't significantly impact the overall performance. It should be noted that most tunnels and underground structures are neither easily inspectable nor accessible (especially exterior faces and corners). The underground structures are designed "elastically" under OBE. However, in high seismic areas the reinforcement is typically increased to limit ductility/strain damage on the exterior faces. Therefore, as long as OBE doesn't specify too high of a ground motion, the MDE will generally govern the reinforcement design. If the structure is damaged under the MDE, the difficulty of repairing the structure may not allow train service to return in a reasonable time frame. Therefore, the structure performance and repairability under the MDE is typically checked very closely by the designers. Based on our design team's past seismic design experience for Underground	06/23/22	ROK	Ok				05/19/22	CC
HSR.003	10.2.2 - Site Response Analysis	FW	04/06/22	This section states "site response analysis must be performed using both equivalent linear and nonlinear techniques". However, it doesn't state which one should be used for the analysis time histories. Do both need be considered in the ground motion application ? This would double the amount of time histories from 11 to 22. How to determine if the equivalent linear or nonlinear results should be used ?	05/05/22	JL	B	As specified in the DCM, both approaches must be performed and an adequate approach will be selected. The same suite of input ground motions will be used in both approaches, and only the results from the adequate approach will be used in design. There are literatures for evaluating the approaches to determine which one is appropriate. This item must be peer reviewed in accordance with the DCM.	06/23/22	ROK	Ok, peer review to determine if linear or nonlinear motions to apply.	05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC
HSR.004	10.3.1 - Analysis	FW	04/06/22	Within the second bullet, it states "In the soil-structure analysis, the gross moment of inertia (Ig) must be used for slabs and an appropriate fraction of the gross moment of inertia (e.g., 0.5 Ig) must be used for walls." This appears to be relative to racking analyses (either pseudo-static of dynamic SSI). For the SEE, how does this approach allow cut/cover strain prediction relative to the post-yield inelastic 0.006 concrete/0.02 steel strain limits in Table 10-1? Isn't a non-linear representation (i.e.: moment-curvature, fiber element) representation of the wall needed ?	05/20/22	JL	C/DE	The moment of inertia will be affected by non-linear response, which is likely in walls under design earthquakes. This sentence provides the specification in modelling structures in dynamic SSI in terms of Ig that depends on whether cracking is expected - i.e., cracked walls will have a lower Ig. With the specified modelling condition, the allowable strains in Table 10-1 must be met. This sentence was revised as follows. "In the soil-structure analysis, the gross moment of inertia (Ig) must be used if uncracked slabs/walls are considered, and an appropriate fraction of the gross moment of inertia (e.g., 0.5 Ig) must be used if cracked slabs/walls are considered."	06/23/22	BCC	Disagree, if model is linear, elastic, then how can you predict inelastic strains ? Do you plan to use "equal-displacement" methodology (effective properties for demands, non-linear properties for push-over/racking capacities ? Otherwise, per original comment, recommend non-linear modeling to determine strains.	08/26/22	JL	Our intent was to require the consideration of reduction in moment of inertia for cracked sections if elastic analysis is performed, not to encourage a simplified approach rather than non-linear analysis. Agreed with reviewer's comment and revised the relevant sentences accordingly as follows. In the soil-structure analysis, elastic models are acceptable if the structural response remains elastic. In elastic analysis, an appropriate fraction of the gross moment of inertia (e.g., 0.5 Ig) must be used if cracked slabs/walls are considered while the gross moment of inertia (Ig) must be used if uncracked slabs/walls are considered. If the structural response is into inelastic range, non-linear analysis must be performed and the resulting strains must be evaluated. CRM with CHSRA held on 5/10 where agreement was reached, comment is considered resolved.	10/05/22	CC
HSR.005	10.3.1 - Analysis	FW	04/06/22	The section states "In addition to maintaining structural capacity, the structure must also maintain its barrier to ingress of flowing ground and protection against inundation by groundwater or other water from ruptured utility lines, or the like, in the event of a rupture of the lining and waterproofing system." This statement needs clarification. If the lining & waterproofing system both rupture, then how can the structure be protected against groundwater inundation ? Are you suggesting a redundant secondary waterproofing system ?	05/20/22	JL	A	Revised to read as follows: "In addition to maintaining structural capacity, the underground structure must also maintain its barrier to the ingress of flowing groundwater as a result of FEE and SEE events."	06/23/22	ROK	Agree	05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC

Transbay Program
Downtown Rail Extension (DTX)
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Total Comments	**70**
Comments Closed	**70**
% Complete	**100%**

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.006	10.3.1 - Analysis	FW	04/06/22	The section states "If joints are proposed within the mined tunnel final lining, the designer must verify the magnitude of joint openings and ensure that adequate joint compression is maintained during seismic events." CHSR criteria is similar and approaches this as the segments are capacity protected by the joints, such that plastic hinges do not form within the segment. The following are required: •No net tension across the joint shall occur. •Joint shear capacity shall be evaluated and compared to shear demands. •Joint bearing and compressive capacity against its bearing surface shall be evaluated and compared to applicable demands.	05/20/22	JL	DE	will consider further clarification in the next revision.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	09/13/22	JL/DP	Agreed. those specifications were added.	09/13/22	CC
HSR.007	10.3.2 - Seismic Load Combinations	FW	04/06/22	Extreme Event T-I, EQ = 1.0 Will this apply to both the FEE & SEE ? In CHSR, the lower level (OBE) event is a separate Strength load case, refer to CHSR.	05/13/22	NLV	A	Re: Extreme T-1, EQ = 1.0. That is the intent. Re: Load Cases. Will evaluate when evaluating Transient Loads listed in Comment HSR.004 for Structures Chapter.	06/23/22	ROK	Ok, but recommend specifying separate load combinations for FEE & SEE (i..e.: Exterme Event T-1a for FEE, T-1b for SEE, or similar)	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.008	"10.3.3" - Structural Component Design	FW	04/06/22	For each tunnel type, what ductile structure components are allowed to undergo inelastic deformation in a design earthquake? Similar to CHSR criteria for rectangular box-type structures, it seems you are intending for the walls to be the targeted region for inelastic deformation (plastic hinges), with the adjacent roof/invert slabs capacity protected & subject to 120% over-strength.	05/20/22	JL	DE	will consider further clarification in the next revision.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	08/31/22	JL/NLV	We do not specify what ductile structure components are allowed to have an inelastic response subject to a design earthquake, but require them to be designed properly also considering the displacement capacity of the structure incorporating its ductile non-linear response. The following sentence was added accordingly. Proper detailing at the ductile components must be provided to support overall seismic design through evaluating the displacement capacity of the structure, capturing its ductile non-linear response. CRM with CHSRA held on 10/5/22 - Reached agreement on response for this phase of design after (appears consistent with LA Metro design criteria).	10/05/22	CC
HSR.009	"10.3.3" - Structural Component Design	FW	04/06/22	Third paragraph states "a displacement ductility ratio of 1.5 must be acceptable as the criteria for operability performance". This is inconsistent with Table 10-1 for FEE (operability) strain limits which, for cut-cover, are 0.003 concrete/0.002 steel. 0.003 concrete strain (cover) is typical limit for strength design & 0.002 is basically yield for grade 60 steel, with expected yield stress of 68 ksi per CSDC (68/29000 = 0.0023). Recommend revising displacement ductility closer to 1.0.	05/24/22	NLV	DE	Designers to evaluate. Direction of next revision would be to refer to Caltrans SDC.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	09/02/22	NLV	Displacement ductility limit corrected to 1.0.	09/02/22	CC
HSR.010	"10.3.3" - Structural Component Design	FW	04/06/22	Fourth paragraph states: "The shear capacities of concrete structures and structural components must be designed for the strength demands, including strength demands based on seismic load combinations. Effective section properties of the walls must be used to evaluate demands associated with seismic racking. All components are essentially elastic." Similar to CHSR criteria for rectangular box-type structure, recommend revisions: 1. Shear capacity of targeted inelastic walls > the plastic shear (Vp = 2Mp/ht) of the walls, using specified minimum f'c & phi = 1.0 2. To assess SEE strain demands in the walls, a nonlinear representation (i.e.: moment-curvature, fiber elements) should be used. 3. Omit "All components are essentially elastic", this doesn't make sense with respect to the allowable SEE strain limits in Table 10-1.	05/20/22	JL	DE	Will consider further clarification in the next revision.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	08/31/22	JL/NLV	Agreed. The sentence, 'All components are essentially elastic', was removed and the following sentence was added. Structures designed for an inelastic behavior in a design earthquake (SEE) must be modeled by appropriate methods accounting for material, component, and geometric nonlinearities. CRM with CHSRA held on 10/5/22 - Reached agreement on response for this phase of design (appears consistent with LA Metro design criteria).	10/05/22	CC
HSR.011	10.3.3 - Material Properties and Allowable Strains	FW	04/06/22	Within Table 10-1, it is assumed that the concrete compressive strain limits are relative to the cover concrete. Note that CHSR has strain limits relative to cover (unconfined) and core (confined) regions, as appropriate. Note that the CHSR reinforcement strain limits are substantially larger than Table 10-1 for both the FEE (or OBE in CHSR), and SEE (or MCE in CHSR). CHSR strain limits are also bar size dependent (i.e.: #10 bar & smaller, #11 bar & larger), consistent with CSDC. Note that the Table 10-1 SEE cut-cover concrete compressive strain of 0.006 exceeds the "spalling strain" of 0.005 within CSDC. Recommend providing SSE concrete limits relative to the core (confined) region, not a cover concrete strain exceeding spalling.	05/24/22	NLV	DE	Designers to evaluate. Direction of next revision would be to refer to Caltrans SDC.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	09/02/22	NLV	Table edited to match CHSRA strain limits.		CC
HSR.012	10.3.4 - Material Properties and Allowable Strains	FW	04/06/22	End of the section states: "The expected concrete compressive strength in a seismic event (f'ce) must be equal to the greater of 5,000 psi or 1.3 times the specified compressive strength (f'c)." This is identical to CSDC, so covered by the last sentence "Caltrans SDC provides values and formulations for expected material properties."	05/05/22	JL	A	Removed first sentence and revised final sentence for reference.	06/23/22	ROK	agree.	05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.013	10.4.2 & 3 - Seismic Loading on Retaining Structures	FW	04/06/22	Refer to CHSR criteria (DCM 32) for a similar, but more extensive break-out of seismic loading for various retaining structures.	05/20/22	JL	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM.	06/23/22	ROK	Agree, understood about SFDBI compliance. I was only pointing out CHSR's more detailed seismic loading for retaining structures.	05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**70**
Comments Closed	**70**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 10, Seismic Design*		
Document date:	*3/18/2022*		

Reviewers			
Name	Initials	Name	Initials
J. Gebelein (Design Team)	JG	E. Qi (Design Team/ATN-Structus)	EQ
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Henry Chang (Design Team/Structus)	HC	Kimo Okamitsu (Design Team)	KO
Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Fletcher Waggoner (CHSRA)	FW	Luis Zurinaga (SF CTA)	LZ
Responders			
Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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B – Responder disagrees for reasons noted
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DE – Designer to evaluate

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BRS - Back-check Response Status
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
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HSR.014	10.4.4 - Factors of Safety for Earth Retaining Structures under Seismic Loading	FW	04/06/22	Instead of a "factor of safety" approach, CHSR criteria (DCM 32) uses the Strength & Extreme limit states with factored resistance for sliding/bearing, and a less conservative eccentricity limit (than B/6) for seismic load case overturning.	05/20/22	JL	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM.	06/23/22	ROK	Agree, understood about SFDBI compliance. I was only pointing out CHSR's use of LRFD design (not factor of safety approach) for retaining structures.	05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC
HSR.015	10.4.4 - Factors of Safety for Earth Retaining Structures under Seismic Loading	FW	04/06/22	Clarify if B/6 eccentricity limit applies for both FEE or SEE.	05/24/22	NLV	A	Limits have been redefined for FEE and SEE.	06/23/22	ROK	Agree, revision confirmed.	05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
HSR.016	10.4.4 - Factors of Safety for Earth Retaining Structures under Seismic Loading	FW	04/06/22	This section states: "Bearing Pressure. Do not consider soil bearing pressure for seismic loads for preliminary design." What is purpose of including this statement in design criteria? Instead, recommend defining what is required for final design.	05/20/22	JL	A	revised this with clarification	06/23/22	ROK	Agree, revision confirmed.	05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.017	10 (first section)	EA	06/23/22	"The performance objectives for each earthquake level are presented in Chapter 2, Owner's Requirements" That information is not in Chapter 2, or anywhere else in the document.	08/18/22	JL	A	Deleted sentence referencing Chapter 2				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC
TA.001	Section 10.10, Peer Review (second para)	LZ	07/04/22	Add "be" between "must" and "approved" in 2nd para	08/18/22	JL	A	Editorial – revised as noted				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

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Comments Closed	**50**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 11, Protection of Existing Infrastructure*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Sangyoon Min (Design Team)	SM	Fletcher Waggoner (CHSRA)	FW
Michael Bowers (CHSRA)	MB	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Martin J. Walker (PMPC SME/Mott MacDonald)	MJW	Derek Penrice (PMPC SME/Mott MacDonald)	DP

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Chapter 11 - Protection of Existing Infrastructure	SM	03/16/22	See tracked changes and review comments in "Chapter 10_Protection of Existing Infrastructure_SM.docx"	04/25/22	MJS	C	Comments from .docx file have been incorporated in this spreadsheet, see comments # GEC.001-008				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	Chapter 11 Revision Record Table, Fifth line	SM	03/15/22	Figure 11.3 may need to be removed to avoid any confusion due to two different definitions of zone of influence. See comments in Section 11.1.1.	05/20/22	MM	A	Figures removed from chapters				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	11.1 - Ground Movements/Settlement Estimates	SM	03/15/22	This section needs more clarification about when to use numerical method and when to use empirical method. To be consistent with the standard practice and previous building damage assessment, this section should discuss different stages of damage assessment of the buildings: For example, Stage 1 is a preliminary damage assessment phase. In this stage, the buildings potentially subject to settlement within the zone of influence are identified. These are taken forward to Stage 2, where more detailed screening of the potential settlement and building assessment are carried out using the empirical methods. For buildings with higher building damage categories exceeding threshold screening criteria in Stage 2, Stage 3 assessment is performed using a finite element numerical modeling. If unacceptable movements and potential building damages are predicted, and depending on the nature of the movements and the structure affected, building protection and mitigation measures will be developed.	05/04/22	MJW	C	The Boscarding and Cording method is mentioned in Section 10.1. Buildings that will require SSI should be evaluated by the designer on a case-by-case basis. Designer will assume some level of risk. Property protection sections have been updated accordingly.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	11.2 - Assessment of Ground and Structure Movements, ¶3-2	SM	03/15/22	This is different from the definition of ZOI included in the previous design criteria which was used in the previous damage assessment report by Arup in 2010, and Parsons in 2017 following instruction by TJPA. According to email from Matt on March 11, the ZOI will be modified to ¼" "I recommend at this point revising to ¼ inch in the criteria, deleting the image (duplicate/extraneous), and shelving the criterion section until the procurement method is clear. The TJPA should be on record that it does not expect Parsons to redo the PPS to conform to the new criteria. The DB contractor will have to update it and take ownership of it when the time comes." The image included in previously version needs to be included to clarify the ZOI for different construction method (cut and cover and mined tunnel) with the new ZOI (1/4").	05/25/22	MJW	A	Revised to ¼ inch in the criteria, deleted the images, and shelved the criterion section until the procurement method is clear. The TJPA should be on record that it does not expect Parsons to redo the PPS to conform to the new criteria. The DB contractor will have to update it and take ownership of it when the time comes.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	11.2 - Assessment of Ground and Structure Movements, ¶4-1	SM	03/15/22	Regarding "Determination of the 1/8-inch ground movement" - see comment above (comment #4) on ZOI.	05/25/22	MJW	A	See response to comment #GEC.004				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	10.2 - Assessment of Ground and Structure Movements, ¶8-1	SM	03/15/22	Two different definitions of ZOI are used. Figures 10-1 and 10-2 may need to be removed to avoid confliction with the definition of ZOI in 10-3 (1/4"). Figure 10-1 and Figure 10-2 are also different from many references that are used for Chapter 10. Those two figures can be used for the first screening purposes, but determination of using underpinning should be based on the detailed analysis anyway. The purpose of the ZOI is to determine buildings to be assessed.	05/04/22	MJW	A	Figures removed from chapters				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	11.2 - Assessment of Ground and Structure Movements, ¶9-1	SM	03/15/22	The SSI analysis may not be required for all structures within the ZOI. This section shall discuss the building damage category (e.g., by Cording etc.) or building vulnerability level with which the structures can be categorized depending on structural stability of structures. It needs to define clearly in which buildings or/and circumstances the designer shall perform SSI interaction (for example, if the damage category of structures are greater than certain level, SSI analysis shall be performed).	05/04/22	MJW	C	The Boscarding and Cording method is mentioned in Section 10.1. Buildings that will require SSI should be evaluated by the designer on a case-by-case basis. Designer will assume some level of risk. Property protection sections have been updated accordingly.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	11.2.1 - Tunnel, Figure 11-3: Evaluation of damage risk for pile-supported structures	SM	03/15/22	Can this figure be appliable to mined tunnel as well? The definition of ZOI is different, and what are the differences between 10-2 and 10-3?	05/25/22	MJW	A	Figures removed from chapters				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	Sect. 10.1	YS		LEGACY Comment GEC18.045 - Requirements discussed in this section and Figures 10.1 and 10.2 do not cover any scenarios where the excavations occurring adjacent to or above an existing underground structures or tunnels which are located in Zone C. Will the DTX alignment exclude these scenarios? Also, pile(s) of the adjacent highway super-structures may be founded in Zone C but influenced by the ground movements induced by underground excavations. This scenario is not captured in these figures.	05/04/22	MJW	A	Pile information has been defined and information applicable to protection of adjacent structures has been clarified.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.010	Section 10.2	SM		LEGACY Comment GEC18.046 - It says " the designer shall perform soil-structure interaction analyses to demonstrate–" The SSI analysis may not be required for all structures within the ZOI. It needs to define clearly in which buildings or/and circumstances the designer shall perform SSI interaction (for example, if the damage category of structures are greater than certain level, SSI analysis shall be performed).	05/04/22	MJW	C	The Boscardin and Cording method is mentioned in Section 10.1. Buildings that will require SSI should be evaluated by the designer on a case-by-case basis. Designer will assume some level of risk.		PAR	This needs to be more specific. For example, no additional analyses are required for buildings with damage categories of "Negligible" and "Very Slight" since these levels of building damage are considered to be cosmetic and insignificant (Burland et al., 1977, and Cording & Boscardin, 1989). However, additional numerical analyses are required for buildings with damage categories of "Slight" or greater.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	Section 10.2	SM		LEGACY Comment GEC18.047 - As per the email from Meghan Murphy in September 9, 2016, the ZOI shall be revised to reflect Arup's approach to the zone of influence (Method 2 in the attachment). Please see attachment. Figures 10.1 and Figures 10.2 shall be replaced with those shown on the attachment with description of the new zone of influence.	05/04/22	AK	A	The previous Figures 10.1 and 10.2 were deleted and the latest zone of influence graphic from Parsons for "Method 2," dated 9/7/16, has been placed in the Design Criteria.		PAR	According to email from Matt on March 11, the ZOI will be modified to ¼" "I recommend at this point revising to ¼ inch in the criteria, deleting the image (duplicate/extraneous), and shelving the criterion section until the procurement method is clear. The TJPA should be on record that it does not expect Parsons to redo the PPS to conform to the new criteria. The DB contractor will have to update it and take ownership of it when the time comes."	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.012	Section 10.2	KA		LEGACY Comment GEC18.048 - Zone of influence diagram. Underpinning has a specific meaning and impacts on existing buildings are influenced by soil type and shoring method. Suggest removing this table as it is misleading.	05/04/22	AK	A	Table has been removed.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.013	10.3 Ground water	KA		LEGACY Comment GEC18.049 - This requirement to avoid where possible can be very restrictive and is in conflict with 9.4. Suggest reference 9.4 here	05/04/22	MJW	A	Groundwater sections have been revised and will be developed in concert with SEIR compliance.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC

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Total Comments	**50**
Comments Closed	**50**
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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 11, Protection of Existing Infrastructure*		
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Reviewers			
Name	Initials	Name	Initials
Sangyoon Min (Design Team)	SM	Fletcher Waggoner (CHSRA)	FW
Michael Bowers (CHSRA)	MB	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
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GEC.014	10.3 zone of influence	KA		LEGACY Comment GEC18.050 - We are providing settlement troughs which make the footnotes of this table redundant. Suggest removing footnotes	05/04/22	AK	A	Footnotes have been removed.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.015	Section 10.2	SM	09/12/16	LEGACY Comment GEC16.051 - It says " the designer shall perform soil-structure interaction analyses to demonstrate–" The SSI analysis may not be required for all structures within the ZOI. This section shall discuss the building damage category (e.g., by Boscarding and Cording etc.) or building vulnerability level with which the structures can be categorized depending on structural stability of structures. It needs to define clearly in which buildings or/and circumstances the designer shall perform SSI interaction (for example, if the damage category of structures are greater than certain level, SSI analysis shall be performed).	05/04/22	MJW	C	The Boscarding and Cording method is mentioned in Section 10.1. Buildings that will require SSI should be evaluated by the designer on a case-by-case basis. Designer will assume some level of risk. Property protection sections have been updated accordingly.		PAR	This needs to be more specific. For example, no additional analyses are required for buildings with damage categories of "Negligible" and "Very Slight" since these levels of building damage are considered to be cosmetic and insignificant (Burland et al., 1977, and Cording & Boscardin, 1989). However, additional numerical analyses are required for buildings with damage categories of "Slight" or greater.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.016	Section 10.2 & 10.3, (Figures 10.1 and 10.2)	SM	09/12/16	LEGACY Comment GEC16.052 - There's still possibility that buildings outside zone of influence defined in Figures 10.1 and 10.2 can be affected by construction activities and need to be analyzed. Therefore, the zone of influence should be defined and determined by the allowable settlement or other conservative approach rather than simply by D:H ratio (e.g., 1:1, 1:2) as shown in Figures 10.1 and 10.2.	05/04/22	AK	A	Zone of influence diagram has been updated for various scenarios.		PAR	Two different definitions of ZOI are used. Figures 10.1, 10.2 and 10.3 need to be removed to avoid any unnecessary confusion. SME has decided to change the ZOI to 1/4".	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.017	Section 10.2 (Figure)	PC	09/12/16	LEGACY Comment GEC16.053 - Internal discussion (TJPA and Design Team): We need to make sure Fig 10.1 is in general agreement with zone of influence lines for building impact analyses that TJPA wants Parsons to take.	05/04/22	AK	A	Updated Zone of Influence diagrams have been inserted into Design Criteria as Figure 10.1. Refer to email dated 9/28/18 from Meghan Murphy titled, "Central Artery experience in future building development of TOD," for additional information.		PAR	Please refer to email responses from Matt Schreffler and Martin Walker. The definition of ZOI has been revised to 1/4" and all figures recommended to be removed.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.018	Section 10.3 (Figure)	PC	09/12/16	LEGACY Comment GEC16.054 - Internal discussion (TJPA and Design Team): We need to make sure Fig 10.2 is in general agreement with zone of influence lines for building impact analyses that TJPA wants Parsons to take.	05/04/22	AK	C	Previous Figure 10.2 has been deleted from the Design Criteria.		PAR	Please refer to email responses from Matt Schreffler and Martin Walker. The definition of ZOI has been revised to 1/4" and all figures recommended to be removed.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.019	Section 10.4	PC	09/12/16	LEGACY Comment GEC16.055 - Is there a specific threshold design table that TJPA want to follow? We should clearly refer to the table as design criteria at the end.	05/04/22	AK	A	Updated Zone of Influence diagrams have been inserted into Design Criteria as Figure 10.1. Refer to email dated 9/28/18 from Meghan Murphy titled, "Central Artery experience in future building development of TOD," for additional information.		PAR	Please refer to email responses from Matt Schreffler and Martin Walker. The definition of ZOI has been revised to 1/4" and all figures recommended to be removed.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.001	Chapter 11 - Scope	FW	03/28/22	"This chapter seems to focus on existing structure protection during construction ""resulting from excavation associated with the construction"". Should the scope also address the post-construction seismic resistance/response (i.e.: no added harm due to the new construction) of the existing structures ? Section 10.2 discusses additional loads imposed upon existing foundations with respect to excavation related ground movements, and mitigations (underpinning, protective works), but not post-construction existing structure seismic response. Is the assumption that the post-construction existing structure seismic resistance/response the same as the current pre-construction state ?"	05/25/22	MJS/DP	B	No, the suggested scope to address post-construction seismic resistance/response of existing structures is not considered within the scope of the DTX Design Criteria.	06/23/22	BCC	Understood, not within scope of DTX Design Criteria. However, to avoid future disputes, recommend TJPA consider existing structure be subject to "no added harm due to new construction" per the original comment.	10/06/22	MJW	The commentor (CHSRA) agreed that the topic is not within the scope of the DTX Design Criteria. The responder (PMPC Team) has agreed to investigate the proposed clause during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/06/22	CC
HSR.002	11.1.1 - Preliminary Evaluation	MB	03/30/22	Shear wave velocity needs to be collected to sufficient depth to establish a reference horizon for site response analysis required by Chapter 13 - Seismic. Consider whether guidance or requirements related to depth and frequency of shear wave velocity measurements in order to obtain adequate ground motions for the project.	05/25/22	MM	C	See revised Chapter 9, Geotechnical Requirements, §9.1.1: "Shear wave and P-wave velocity information must be collected to adequate depth to establish a reference horizon."	06/23/22	ROK	Agree, revision confirmed.				06/23/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 50
Comments Closed 50
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 11, Protection of Existing Infrastructure*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Sangyoon Min (Design Team)	SM	Fletcher Waggoner (CHSRA)	FW
Michael Bowers (CHSRA)	MB	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Martin J. Walker (PMPC SME/Mott MacDonald)	MJW	Derek Penrice (PMPC SME/Mott MacDonald)	DP

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
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BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
Cal.001	Chapter 11.1.1	JP	04/29/22	Geotech review	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.002	Chapter 11.1.1	JP	04/29/22	Including vertical and horizontal	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.003	Chapter 11.1.1	JP	04/29/22	TJPA approval	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.004	Chapter 11.1.2	JP	04/29/22	As defined in section 10.2	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.005	Chapter 11.1.2	JP	04/29/22	3rd party review	05/25/22	MM	C	Comment noted but not necessary to modify until third parties are identified.							05/25/22	CC
Cal.006	Chapter 11.1.3	JP	04/29/22	Surface and subsurface	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.007	Chapter 11.2	JP	04/29/22	Reference source of 1/8" criteria	05/25/22	MM	C	Revised to 1/4" per SME direction for this stage of design. The DTX Design Criteria will be updated prior to DB contractor selection with reference.							05/25/22	CC
Cal.008	Chapter 11.2	JP	04/29/22	Reference monitoring chapter 9, section 9.6	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.009	Chapter 11.2	JP	04/29/22	Cut-and Cover Structure heading for next subsection, number accordingly	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.010	Chapter 11.2	JP	04/29/22	For each structure considered	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.011	Chapter 11.2	JP	04/29/22	Geotechnical engineer and TJPA. (space)	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.012	Chapter 11.2	JP	04/29/22	Shall	05/25/22	MM	C	Verbiage has been selected and approved by TJPA, using the imperative "will" or "must"							05/25/22	CC
Cal.013	Chapter 11.2	JP	04/29/22	(bullet) Alternate method approved by TJPA	05/25/22	MM	A	Revised as noted, added new bullet: "Alternate method(s) approved by the TJPA"				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.014	Chapter 11.2	JP	04/29/22	Soil slope(s) to be determined by geotechnical engineer	05/25/22	MM	A	Figure 11.1 removed.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.015	Chapter 11.2	JP	04/29/22	Reference standard or guideline	05/25/22	MM	A	Figure 11.2 removed.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.016	Chapter 11.2.1	JP	04/29/22	Soil slope(s) to be determined by geotechnical engineer	05/25/22	MM	A	Figure 11.2 removed.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.017	Chapter 11.2.1	JP	04/29/22	Criteria established by design parameter, section 10.2	05/25/22	MM	C	Order of information does not require pointing backward in same chapter.							05/25/22	CC
Cal.018	Chapter 11.2.1	JP	04/29/22	Reference standard or design guideline	05/25/22	MM	A	This ratio is found in numerous technical papers. A reference will be included in the next revision of the DCM.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.019	Chapter 11.2.1	JP	04/29/22	Movements and the potential for'	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.020	Chapter 11.3	JP	04/29/22	Geotechnical engineer to determine slope of soil	05/25/22	MM	A	Figure 11.3 removed.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.021	Chapter 11.3	JP	04/29/22	Reference standard or design guideline	05/25/22	MJS	A	Figure 11.3 removed.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.022	Chapter 11.3	JP	04/29/22	Revise; limits of the established design parameters, section 10.2.	05/25/22	MM	A	Revised to read as follows: "Protective works are required for infrastructure within the zone of influence of the cut-and-cover structures and tunnel where predicted values for movement exceed the limits of parameters established in section 11.2. "				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.023	Chapter 11.3	JP	04/29/22	Summary estimates shall be submitted to the TJPA for review	05/25/22	MM	A	Revised to read as follows: "A summary assessment for every building, utility, or other structure or facility within the zone of influence must be prepared for TJPA approval. The summary assessment must include an estimate as well as a description, category of potential damage, and proposed mitigations, including a recommendation for the use of protective works and the nature of the proposed protective works."				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.024	Chapter 11 Section 11.2.1; (Page 11-4 of 6)	JP	06/30/22	omit sentence fragment at the end of the first paragraph	09/03/22	MJW	A	Fragment "Cut-and-Cover Structures" deleted. It appears formatting has gone awry in the document.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.001	Chapter 11 - General	LZ	07/04/22	Should have a more thorough description of the toolbox methods for protection of infrastructure	09/03/22	MJW	A	By not detailing the toolbox of methods available for protection of infrastructure, the design criterion leaves it to the designer to implement from their selection. As this will be a progressive design-build or design-build, these will be the responsibility of the designer to develop. However, the sentiment is not lost and language has been added to the Protective Works section, "The designer must develop a toolbox of methods to be implemented for protective works."	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.002	Section 11.2.1, Cut-and-Cover Structures	LZ	07/04/22	How will this work in practicality? What if the property owner wants settlement and rotation parameters that cannot be reasonably achieved?	09/03/22	MJW	A	The implementation of these agreements is beyond the scope of the DCM. I have deleted the "must be developed in conjunction with the owners of existing infrastructure." This way it just says that the TJPA will negotiate the agreement but that the designer has to develop the parameters of movement. This way it removes the implication that the owners have a say (in reality, they do of course - especially existing agencies with their own design criteria).	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.003	Section 11.2.2, Tunnel	LZ	07/04/22	The tunnels are not round, so they do not have a diameter (referring to 0.75D equation) need to specify the location of the measurement.	09/03/22	MJW	A	Revised to "For piles located within a 1:1 line extending upwards and outwards from the tunnel springline..." The team appreciates this catch.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.004	Section 11.3, Protective Works (first para)	LZ	07/04/22	States: " However, the implementation of protective works can cause deformations that may be as severe as the deformations that these measures are intended to mitigate". What is proposed to avoid those deformations to take place?	09/03/22	MJW	A	Added ", and this must be considered in the selection of protective works methods."				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.005	Section 11.3, Protective Works (second/third para)	LZ	07/04/22	TJPA approval could result in TJPA liability. how will this be avoided?	09/03/22	MJW	A	revised "approval" to "acceptance."				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
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Total Comments 123
Comments Closed 123
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 12, Structures*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Andrew Baltay (Design Team/MJA)	AEB	Margaritte Bello (Design Team)	MB
Y. Sun (Design Team/MJA)	YS	Fletcher Waggoner (CHSRA)	FW
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Noel Vivar (PMPC SME/Mott MacDonald)	NLV	Amanda Kaku (PMPC/HCI)	AK

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Chapter 12 - Structures	MB	03/18/22	See tracked changes and review comments in "Chapter 11_Structures with MB comments.docx"	05/02/22	MJS	C	Captured in this CRL, See comments #GEC.013-GEC.022				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	Chapter 12 Figure 12.1	DL	03/15/22	The dimensions in the train diagram is blurry and not readable. The axle loads are provided in the text however the axle distances cannot be identified from the diagram	05/02/22	MJS	C	Critical dimensions are provided in table 2 - the image is only provided as a reference.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	Chapter 12_Structutres, 12.1.1, page 13-14 of 22	AEB	03/17/22	Suggest updating the cast-in-place substructure/superstructure concrete and shotcrete compressive strength to 5000 psi	05/13/22	NLV	B	Values listed are minimum f'c values. EOR may specify higher strength.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	Chapter 12_Structutres, 12.2.2.4, page 14 of 22	AEB	03/17/22	Suggest adding reference to ACI 318 in regards to bar lengths, laps, bends, etc.	05/13/22	NLV	B	Intent is to use LRFD Tunnels and CBDS for laps, bends, etc. ACI 318 left off in case there are any conflicting guidance or formulas. Open to discussion for next revision of DCM.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	Chapter 12 Codes and Standards, pg. 12-1	YS	12/10/21	Add the following: American Institute of Steel Construction (AISC). 2016. ANSI/AISC 360-16 – Specification for Structural Steel Buildings. ASTM International. ASTM A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.	05/13/22	NLV	A	Agree. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	Chapter 12, 12.2.2.2 Crack Width/Control	DMJ/KO	03/22/22	A state of the art waterproofing system is required. The waterproofing and the requirement for temperature and shrinkage reinforcement will adequately control cracking and provide the required water tightness. The exposure factor gamma_e should be specified taking the presence of the waterproofing System into account	05/13/22	NLV	B	Disagree. Crack width control, in addition to the waterproofing system, is an integral part of achieving design life goals.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	Ch 12, Page 11-1 of 19	YS	04/08/22	Add the following: American Institute of Steel Construction (AISC). 2016. ANSI/AISC 360-16 – Specification for Structural Steel Buildings. ASTM International. ASTM A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.	05/13/22	NLV	A	Agree. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	Ch 12, Page 11-2 of 19	YS	04/08/22	Suggest adding the following references: American Society of Civil Engineers. 2016. ASCE/SEI 7-22 – Minimum Design Loads for Buildings and Other Structures. The Concrete Society. 2007. Technical Report No. 63: Guidance for the Design of Steel-Fiber-Reinforced Concrete. John, Max, and Bruno Mattle. 2003. Shotcrete lining design: Factors of influence. In Proceedings of the Rapid Excavation and Tunneling Conference. 726–734. German Committee for Structural Concrete. 2015. DAfStb Guideline: Steel Fiber Reinforced Concrete. Bieniawski, Z.T. (1989). Engineering Rock Mass Classifications, New York: Wiley.	05/13/22	NLV	A	ASCE 7 is included in codes. Agree to Concrete Society Technical Report 63. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	12 - Codes and Standards, Sixth bullet (2019 SFBC)	MB	03/03/22	Is the version required if above says the latest edition?	05/13/22	NLV	A	Agree. Will remove the year from SFBC. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	12 - Codes and Standards, Seventh bullet (ASCE)	MB	03/03/22	Is the version required if above says the latest edition?	05/13/22	NLV	A	Agree. Will remove the version from ASCE. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	12 - Codes and Standards, Seventh bullet (ASCE)	MB	03/03/22	Add new sub-bullet "ASCE 41 Seismic Evaluation and Retrofit of Existing Buildings" The evaluation procedures are still applicable to new buildings, and this is a widely used national standard	05/13/22	NLV	A	Agree. Will add ASCE 41. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.012	12.1.2 - Concrete Reinforcing Steel, ASTM A706 Grade 80	MB	03/03/22	Grade 80 is often used for ties also, not just straight bars.	05/13/22	NLV	A	Agree. Will change clause. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.013	12.2.1.2 - Transient Loads, B - Live Load Surcharge (LS) (Minimum Life Load Surcharge, ¶3-1	MB	03/03/22	In regards to "600 psf for x < 5;" - Are bike lanes designed for this load also?	05/13/22	NLV	C	That is the intent.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 12, Structures*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Andrew Baltay (Design Team/MJA)	AEB	Margaritte Bello (Design Team)	MB
Y. Sun (Design Team/MJA)	YS	Fletcher Waggoner (CHSRA)	FW
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
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Noel Vivar (PMPC SME/Mott MacDonald)	NLV	Amanda Kaku (PMPC/HCI)	AK

AC – Action Code
A – Responder agrees and will comply
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ROK – response okay
BCC – Back-check comment

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OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.014	12.2.1.2 - Transient Loads, F - Water Loads (WA, Waf, WAt), ¶3, Third bullet	MB	03/03/22	In regards to "100-year flood level" - And king tides and sea level rise?	05/13/22	NLV	C	That is the intent.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.015	12.2.1.4 - Buoyancy	MB	03/03/22	ASCE 7-16 2.3.1 Load Combinations for Strength Design specifies load factors of 1.6 when ground water effects, H, adds to the principal load effect, 0.9 when H resists the principal load effect and is permanent, and 0 for all other conditions.	05/13/22	NLV	B	Intent is to add a resistance to buoyancy global stability check in addition to what is required by AASHTO LRFD Tunnels + CBDS for cut-and-cover structures. For buildings and Miscellaneous Structures, CBC+SFBC load combinations would be applicable as per Sections 11.6 and 11.7.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.016	12.2.1.4 - Buoyancy, ¶3-2	MB	03/03/22	In regards to "depth of backfill calculated to resist.." - and groundwater?	05/13/22	NLV	C	Sentence referenced states to ignore the top 2 feet of backfill when calculating weight to resist buoyancy uplift. Groundwater elevation considered should be at the three levels listed at the beginning of the section.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.017	12.2.2.5 - Joints, A - Interface Joints, ¶2-3	MB	03/03/22	In regards to "See Chapter 10, Seismic Design, for additional requirements." - Is the seismic design criteria in Chapter 10?			A	Yes, Some of the Rev 01 chapters have been removed/combined, or re-ordered in Rev Book 02.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.018	12.3.4 - Loads, ¶1-2	MB	03/03/22	Is there still a Chapter 13? If not, where will the seismic design criteria be provided?			A	In the DTX Design Criteria Rev Book 02, Chapter 10 is Seismic Design. This reference will be updated in the final.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.019	Chapter 12, 12.2.1.2.A, pg. 11-9	BSP	04/25/22	Sidewalk LL - 600psf live load is significantly larger sidewalk LL than typically designed for (CBC sidewalk LL = 250psf). The Salesforce Transit Center Phase 1 design was designed for greater of AASHTO HL93 and 250psf. Recommend revising criteria to agree with the Phase 1 STC design.	05/13/22	NLV	A	Will revise to 250 psf pedestrian load and HS20-44 (non-concurrent) with direction on distribution of load through fill. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.020	Chapter 11	PC	09/12/16	LEGACY Comment GEC16.056 - Add a sub-section describing Underground Structure Waterproofing design requirements	02/28/22	AK	C	Added reference to Table 2.6, Permissible Infiltration Rates for requirements, but will need further verification from SME to make sure these requirements are sufficient.		ROK	Agree and suggest to keep this open for further evaluation.				05/04/22	CC
GEC.021	Section 11.2.1.8	PC	09/12/16	LEGACY Comment GEC16.057 - Lateral Pressures: …….numerical analyses may be performed, and equivalent lateral earth pressure diagrams resulting from these analyses will be provided. When numerical analyses are performed, the load factor used for Active Pressure or Apparent Earth Pressure shall be used in the design.	02/28/22	AG	A	Added.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.022	Section 11.3.4	PC	09/12/16	LEGACY Comment GEC16.058 - In Ch. 2.7.1, it states ASD shall be used for temporary structures. Please state here ASD should be used for excavation support and then follow Table 11.5	02/28/22	AG	A	Added first sentence to first paragraph: "Allowable Stress Design (ASD) shall be used in the design for excavation support…".		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.023	Section 11.3.5	PC	09/12/16	LEGACY Comment GEC16.059 - Distinction…… The wall shall be designed to resist the loads from at rest earth pressure in the final long-term condition. At-rest earth pressure for all types of excavation supports are not practical. Please defer this to geotechnical report/memo.	02/28/22	AK/NLV	A	Modified sentence to say that permanent wall systems to be designed for at-rest wall pressures.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.024	Page 11-1 of 26	HC	09/12/16	LEGACY Comment GEC16.060 - Under the sub-heading of Scope, "passenger stations, support of excavation, U-walls, earth-retaining structures, ventilation and egress structures, buildings and miscellaneous structures" are lumped under "cut-and-cover structures". It is probably not intended. Please revise to clarify.	02/28/22	AG	A	Revised to read: "TJPA-owned facilities including cut-and-cover structures, passenger stations, support of excavation…"		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.025	Section 11.1.1 Page 11-1 of 26	HC	09/12/16	LEGACY Comment GEC16.061 - Under the sub-heading of 11.1.1, "Concrete": Please confirm if only normal weight aggregates are allowed, and no light weight aggregates are allowed.	02/28/22	NLV	C	No lightweight aggregates are allowed.		ROK					05/04/22	CC
GEC.026	11.2.1.1 Page 11-4 of 26	HC	09/12/16	LEGACY Comment GEC16.062 - Under the sub-heading of, 11.2.1.1, "Dead Loads": Please consider revising "stair stringers" to "stairs and landings".	02/28/22	AG	A	Revised.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.027	Section 11.2.1.1 Page 11-4 of 26	HC	09/12/16	LEGACY Comment GEC16.063 - Under the sub-heading of 11.2.1.1, "Superimposed Dead Load – Buildings": Please clarify if concentrated loads, including seismic loads, from buildings should be considered for cut-and-cover structure design. Please also clarify how the cut-and-cover structure design could accommodate future additions for seismic resisting systems of the supported buildings when they undergo seismic strengthening work.	02/28/22	NLV	A	Section has been revised to refer to the TOD directly. For the first question: The load paths and distribution of loads from the TOD structure to the cut-and-cover structure must be congruent between the two designs. Load path from the TOD Structure through the cut-and-cover structure must be continuous and consistent, i.e. the reaction loads from the TOD structure should tie in as applied loads to the TOD structure. Furthermore, the reactions from the seismic-resisting system of the TOD should also be applied to the cut-and-cover structure. However, this is beyond the scope of this Chapter. See Chapter 13 Seismic Design. For the second question: Future additions/retrofits by others outside of the scope of the current project configurations is not in the scope of this Design Criteria.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.028	Section 11.2.1.12 Page 11-9 of 26	HC	09/12/16	LEGACY Comment GEC16.064 - Under the sub-heading of 11.2.1.12, "Collision Loads": Please clarify the first sentence regarding where "raised walkways or guard rails are provided". For example, if a U wall structure has raised walkway and guard rails above the top of U wall, is U wall exempt from collision load requirement?	02/28/22	NLV	A	Now under Section 11.2.1.2.6 Collision Loads. Section modified to refer back to AREMA and CBDS for collision loading.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 123
Comments Closed 123
% Complete 100%

Document Control File Code:

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GEC.029	Section 11.2.1.14 Page 11-10 of 26	HC	09/12/16	LEGACY Comment GEC16.065 - Under the sub-heading of "11.2.1.14, "Load Factors and Combinations": For 500-year flood condition, please clarify the discrepancy between load factor of 1.0 (D + E + B) vs. the load factor of 1.02 for 500-year flood load shown in Page 11-11 of 26.	02/28/22	NLV	A	Section changed to use AASHTO LRFD Tunnels Guide Specifications load factors and load combinations		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.030	Section 11.3 (Table) Page 11-10 of 26	HC	09/12/16	LEGACY Comment GEC16.066 - Under the sub-heading of Chapter 11-Structures, Table 11.3, "Allowable Stress Load Factors and Combination": Allowable Percentage of Basic Unit Stress is 125. Please clarify if newer provisions of ASCE 7-16 where the allowable percentage is now 120 should be considered.	02/28/22	NLV	A	Section changed to use AASHTO LRFD Tunnels Guide Specifications load factors and load combinations		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.031	Page 11-11 of 26	HC	09/12/16	LEGACY Comment GEC16.067 - Under the sub-heading of "Case 2 and Case 3": Please clarify if earthquake forces should be considered.	02/28/22	NLV	C	Section removed from this Chapter.		ROK					05/04/22	CC
GEC.032	Section 11.2.1.15 Page 11-11 of 26	HC	09/12/16	LEGACY Comment GEC16.068 - Under the sub-heading of 11.2.1.15, "Buoyancy": Please see comment 7 for possible discrepancy with 11.2.1.14.	02/28/22	NLV	C	For permanent construction, a buoyancy factor of safety of 1.10 applies to the normal high-water level.		ROK					05/04/22	CC
GEC.033	Section 11.2.1.15 Page 11-12 of 26	HC	09/12/16	LEGACY Comment GEC16.069 - Under the sub-heading of 11.2.1.15, "Buoyancy": During construction, a safety factor of 1.10 is required for buoyancy. Please clarify if a similar safety factor is needed for permanent construction.	02/28/22	NLV	C	For permanent construction, a buoyancy factor of safety of 1.10 applies to the normal high-water level.		ROK					05/04/22	CC
GEC.034	Section 11.4 Page 11-13 of 26	HC	09/12/16	LEGACY Comment GEC16.070 - Under the sub-heading of Table 11.4, "Minimum Concrete Cover to Reinforcement": Please clarify minimum concrete cover for pre-stress tendons. Depending on the type of aggregates and fire rating, minimum concrete cover could differ.	02/28/22	NLV	A	This section has been changed to follow California Bridge Design Specification (CBDS).		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.035	Section 11.2.2.2.4 Page 11-15 of 26	HC	09/12/16	LEGACY Comment GEC16.071 - Under the sub-heading of 11.2.2.2.4, "Detailing": Please clarify requirement for a "closed loop" in the last sentence. Please clarify if hoops with alternating hair pins having 135 and 90 degree hooks (common practice in the industry to allow ease of primary rebar installation) are acceptable in lieu of "closed loop" ties.	02/28/22	NLV	A	This clause applies to beam elements like rectangular beams. The requirement states that any beam cross sections must have a closed loop shear stirrup. Added clause to include shear reinforcement in walls and slabs with alternating hooks, as suggested.		PAR	ACI 318-19 Section 18.6.4.3: Hoops in beams shall be permitted to be made up of two pieces of reinforcement: a (U-shaped) stirrup having seismic hooks at both ends and closed by a crosstie Closed hoops are required at columns and wall boundary elements to provide confinement.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.036	Section 11.5 Page 11-18 of 26	HC	09/12/16	LEGACY Comment GEC16.072 - Under the sub-heading Table 11.5, "Design Load Combinations for External Support (for Temporary Structures using Steel Members)": For deck beams and horizontal supporting framework a live load of 100 psf has been specified for sidewalks. Please revise to 250 psf live load for sidewalks as required by building code.	02/28/22	NLV	B	Disagree. The applicable code for Street and Sidewalk Decking is CBDS. However, it is at the discretion of the Designer to use a greater load.		PAR		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.037	Section 11.5 (Table) Page 11-18 of 26	HC	09/12/16	LEGACY Comment GEC16.073 - Under the sub-heading of Chapter 11-Structures, Table 11.5, "Design Load Combinations for External Support (for Temporary Structures using Steel Members)": For railing, there is a typo under the column of vertical load: CBS should be revised to read as CBDS.	02/28/22	AK	A	Agreed. Table 11.5 has been fixed.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.038	Section 11.3.10.3 Page 11-21 of 26	HC	09/12/16	LEGACY Comment GEC16.074 - Under the sub-heading of 11.3.10.3, "Excavation Base Stability": All provisions shown appear to be for geotechnical engineering rather than structural. Please consider moving this provision to Chapter 9.	02/28/22	NLV/MJW	A	Agree. Section 11.3.10.3 Excavation Base Stability has been moved to Chapter 9 Geotechnical Design.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.039	Section 11.4.7.3 Page 11-23 of 26	HC	09/12/16	LEGACY Comment GEC16.075 - Under the sub-heading of 11.4.7.3, "Stability-Sliding": The provision to disregard 3 ft. of earth above the base slab for sliding resistance is confusing as there is usually no earth above base slab. Please clarify.	02/28/22	NLV	A	Agreed. Will revise to read that top 3 ft of cover at finished grade in front of wall (toe side) is to be ignored for sliding stability check.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.040	Section 11.5.3 Page 11-24 of 26	HC	09/12/16	LEGACY Comment GEC16.076 - Under the sub-heading 11.5.3, "Buoyancy": Please clarify how "existing factors of safety against hydrostatic uplift" could be ascertained.	02/28/22	NLV	C	Determine the existing factor of safety resisting hydrostatic uplift. That calculated existing factor would be the factor of safety to design for.		ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.041	Page 11-18 of 26	HC	09/12/16	LEGACY Comment GEC16.077 - Under the sub-heading of "Scope": Revise the last sentence of the first paragraph to read, "In addition, criteria for temporary structures…, are provided herein."	02/28/22	AK	A	Added "Temporary structures and…" to the beginning of the second bullet point in the first paragraph of the Scope section.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.042	Chapter 11 Standards	KA		LEGACY Comment GEC18.051 - AASHTO is the most common standard for underground structures	02/28/22	NLV	A	Agree. Will revise to include AASHTO LRFD Road Tunnel Design and Construction Guide Specifications. AASHTO LRFD Tunnel should be used for tunnel design principles. AREMA will supersede AASHTO LRFD Tunnel for loading and checks and should be used for design.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.043	DC 11.1.1	PC		LEGACY Comment GEC18.052 - Add "Precast Concrete: suggest 5,000 psi min.	02/28/22	NLV	A	Agree - updated per comment.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.044	11.1.2	KA		LEGACY Comment GEC18.053 - Higher yield rebar is becoming common. ACI provides design max yield. Verify those values are acceptable	02/28/22	NLV	C	ASTM A706 Gr 80 may be used for straight bars in capacity protected members only. Grade 80 bars are not be used in Seismic Critical Members. See CBDS and Caltrans Seismic Design Criteria for more information. Clause edited to reflect Caltrans SDC allowed usage and to reference Caltrans SDC for information.		ROK	No additional comment				05/04/22	CC
GEC.045	11.1.2	DMJ		LEGACY Comment GEC18.054 - Allow the use of grade 75 or 80 A706 reinforcing in non-ductile elements	02/28/22	NLV	C	ASTM A706 Gr 80 may be used for straight bars in capacity-protected members only. Grade 80 bars are not to be used in Seismic Critical Members. See CBDS and Caltrans Seismic Design Criteria for more information.		ROK					05/04/22	CC
GEC.046	DC 11.1.2	PC		LEGACY Comment GEC18.055 - Add "Steel Fibers conforming to ASTM A820	02/28/22	NLV	B	Section revised - Concrete Reinforcing Steel must conform to ASTM A706.		PAR	How about steel fibers?	05/26/22	MM	Will be evaluted in next revision of DCM.	05/26/22	CC
GEC.047	11.1.4 anchor bolts	KA		LEGACY Comment GEC18.056 - There may reasons to use anchor bolts other than A449; seems too restrictive.	02/28/22	NLV	A	Section changed to require ASTM F1554, which complies with CBDS and is the AISC preferred material specification.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.048	11.1.4 steel connections	KA		LEGACY Comment GEC18.057 - Setting 7/8" as the standard bolt diameter is not good practice. Designer should be allowed to use 1 ¼" or 5/8" if the situation calls for it.	02/28/22	NLV	A	Agree. Clause changed to read as 5/8" dia bolt is the minimum diameter.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.049	11.2.1	DL		LEGACY Comment GEC18.058 - Provisions for wind load which is not found which is required for above-ground structure and their foundation.	02/28/22	NLV	A	Agreed. In addition, piston action of trains should be included. Section 11.2.1 specifies minimum loads. Designer may consider other loads at their discretion.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.050	11.2.1.1	DMJ		LEGACY Comment GEC18.059 - Delete the maximum number of building stories for dead load	02/28/22	NLV	A	Agreed. The requirement for a maximum number of stories has been removed and replaced with direct reference of the TOD.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC

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GEC.051	11.2.1.8 backfill weight	KA		LEGACY Comment GEC18.060 - The 130 pcf would prevent designer from using foam blocks or cellular fill to reduce overburden. Is that the intent?	02/28/22	NLV	B	Disagree. 130 pcf would be the best practice to ensure robustness and future-proof the design of the cut-and-cover structure against any future fills. Furthermore, foam fill is not recommended in urban areas since it may dissolve in the presence of chemicals from roadways. If there are specific areas that will not have adverse exposure to chemicals, a design variance may be requested.		ROK	No additional comment				05/04/22	CC
GEC.052	11.2.2.1 Table 11.4	DL		LEGACY Comment GEC18.061 - There are some N/A for precast concrete. Does that mean the use of precast concrete is excluded in such application? Also, does the cover for CIP concrete also applies to pre/post tensioning strands and ducts (such as CIP PT roof slab)?	02/28/22	NLV	A	Table 11.4 has been removed and replaced by a reference to CBDS minimum concrete cover.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.053	11.2.2.2	DMJ		LEGACY Comment GEC18.062 - Delete crack width limit check – with properly designed, detailed and waterproofed structure limit has minimal additional value	02/28/22	NLV	B	Disagree. Both crack control and waterproofing membrane are useful for designing watertightness. [NLV ed. to be confirmed with Waterproofing SME.]		PAR	Discussion required. Waterproofing requirement is sufficient.	05/26/22	MM	Will be evaluted in next revision of DCM.	05/26/22	CC
GEC.054	11.2.2.5	DL		LEGACY Comment GEC18.063 - Movement joint required at significant cross section change. This might introduce difficulty in throat section and interrupts structural continuity of the throat section.	02/28/22	NLV	A	Agreed - Section modified per comment		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.055	11.2.1.3	DMJ	11/02/21	LEGACY Comment GEC21.001 - Revise Criteria in Section 11.2.1.3 to say, "Roadway live loads shall be per AASHTO LRFD 8th Edition with Caltrans Amendments."	02/28/22	AK	A	Revised.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.056	11.2.1.4 (new section)	DMJ	10/28/21	LEGACY Comment GEC21.002 - Clarify the live loads for the cut-and-cover structures that will support the future TOD. (see email from David Jones - 10/28)	02/28/22	AK	A	Added a new section that includes the live load factors for the future TOD.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.057	12.2.1.4	MB	08/03/22	Reference to Table 11.1 should be Table 12.1.	09/02/22	NLV	A	Table reference corrected.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.058	12.2.1.3, Load Factors and Combinations (first sentence)	MB	08/17/22	There should be no "s" after AASHTO and the Table reference (currently "Table 3.4.11") should be "Table 3.4.1"	09/02/22	NLV	A	Revised section as noted, and corrected AASHTO Table reference.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**123**
Comments Closed	**123**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 12, Structures*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Andrew Baltay (Design Team/MJA)	AEB	Margaritte Bello (Design Team)	MB
Y. Sun (Design Team/MJA)	YS	Fletcher Waggoner (CHSRA)	FW
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Noel Vivar (PMPC SME/Mott MacDonald)	NLV	Amanda Kaku (PMPC/HCI)	AK

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HSR.001	12.1.7, Table 11-1	FW	03/28/22	Unit weights for CHSR application missing (electrification, OCS poles, cable trough, etc.), refer to current CHSR criteria.	05/13/22	NLV	DE	Section is for materials unit weights. Comment more applicable to Section 11.2.1.1 Superimposed Dead Loads. Will include clause in 11.2.1.1 Superimposed Dead Loads to use actual weights of components and make reference to CHSRA Design Criteria for weights of components are not known. Marked as "DE" to flag that change has been made in a different section than where commentor proposes. Change complete.	06/23/22	ROK	Agree, revision confirmed.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.002	12.1.8	FW	03/28/22	Sheet waterproofing membranes with specific performance requirements are specific on CHSR tunnels, refer to CHSR criteria for details.	05/13/22	NLV	B	TJPA has prepared a project-specific design criteria in accordance with applicable codes. TJPA has reviewed the CHSRA against the DTX criteria and considers the DTX criteria provided acceptable practice.	06/23/22	ROK	Ok, I was only pointing out CHSR's waterproofing performance requirements for comparison.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.003	12.1.8 & 12.2.2.1	FW	03/28/22	CHSR criteria has minimum concrete cover requirements for application type & noncorrosive or corrosive environments, refer to CHSR criteria for details.	05/13/22	NLV	B	TJPA has prepared a project-specific design criteria in accordance with applicable codes. TJPA has reviewed the CHSRA against the DTX criteria and considers the DTX criteria provided acceptable practice.	06/23/22	ROK	Ok, I was only pointing out CHSR's minimum cover requirement for comparison.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.004	12.2.1.1	FW	03/28/22	"Loading missing from this Permanent Loads section include: 1 locked-in construction forces 2. creep effects 3. settlement effects Verify if no amendments needed to AASHTO LRFD Tunnels for these. Refer to CHSR criteria for additional guidance, if applicable. Note that CHSR criteria includes water loads (WA) as permanent loading. "	05/13/22	NLV	B	Loads listed in the section describe minimum loading outside of what would be considered in AASHTO LRFD Tunnels + CBDS. Loads are still required to be considered in AASHTO LRFD + CBDS.	06/23/22	ROK	Agree, it unstated loads occur then AASHTO LRFD Tunnels + CBDS can cover application & appropriate load factors.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.005	12.2.1.1.A	FW	03/28/22	CHSR criteria has detailed OCS Support & fixed equipment loads and loading diagrams, refer to CHSR criteria for details.	05/13/22	NLV	DE	Will include reference to CHSRA DCM for OCS & fixed equipment loading diagrams in Section 11.2.1.1.A (not .B). Marked as "DE" to flag that change has been made in a different section than where commenter proposes. Change complete.	06/23/22	ROK	Agree, revision confirmed.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.006	12.2.1.2	FW	03/28/22	"Loading missing from this Transient Loads section include: 1 nosing/hunting effects 2. derailment loads 3. thermal loads 4. fire loads Verify if no amendments needed to AASHTO LRFD Tunnels for these. Refer to CHSR criteria for guidance, if applicable. "	05/13/22	NLV	DE	Will evaluate each of the loads listed for inclusion. Assessments for fire performance are in progress as part of the Threat and Vulnerability Assessment.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	09/02/22	NLV	Nosing and hunting load has been added. Derailment load has been added. Thermal load is covered by AASHTO Tunnel LRFD and CBDS. No additional description of load is needed by this document. Assessments for fire performance are in progress as part of the Threat and Vulnerability Assessment.	09/07/22	CC
HSR.007	12.2.1.3	FW	03/28/22	"I believe you mean Table 3.4-1 ? Extreme Event T-I, EQ = 1.0 Will this apply to both the FEE & SEE ? In CHSR, the lower level functional (operational) event is a separate Strength load case, refer to CHSR."	05/13/22	NLV	A	Re: table reference. Agree. Change complete. Re: Load Cases and FEE/SEE. Will evaluate for next revision.	06/23/22	ROK	Agree. Recommend specifying separate load combinations for FEE & SEE (i..e.: Exterme Event T-1a for FEE, T-1b for SEE, or similar)	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	09/07/22	CC
HSR.008	12.2.1.4	FW	03/28/22	"Do AASHTO Tunnels buoyancy related load cases T-1A (service), and T-II (construction) apply to this section ? T-1A has a load factor of 0.9 (DL) & 1.1 (WA). The factor of safety commentary here seems to duplicate the WA load factor The CHSR criteria has a higher WA load factor of 1.25 than AASHTO Tunnels for T-1A.. "	05/13/22	NLV	B	Intent is to add a resistance to buoyancy global stability check in addition to what is required by AASHTO LRFD Tunnels + CBDS for cut-and-cover structures. TJPA has prepared a project-specific design criteria in accordance with applicable codes. TJPA has reviewed the CHSRA against the DTX criteria and considers the DTX criteria provided acceptable practice.	06/23/22	BCC	Disagree, if the global stabililty check is in addition to AASHTO LRFD Tunnels then recommend creating an applicable load case with applicable load factors.	09/02/22	NLV	Agree now. The clause giving bouyancy global factors of safety has been removed. In its place, the AASHTO LRFD Load combination Service T-IA has been changed such that the WA Load Factor = 1.25.	09/07/22	CC
HSR.009	12.2.2.4	FW	03/28/22	"For cut-and-cover tunnels, additional CHSR requirements are: 1. minimum of two layers of reinforcement at the interior and exterior faces (i.e.: double curtain). 2. for the SEE, targeted regions for plastic hinges are in the walls, with the adjacent roof/invert slab capacity protected (perhaps a more appropriate issue for the seismic chapter)"	05/13/22	NLV	A	Will include double layer reinforcement requirement. Change complete.	06/23/22	ROK	Agree, revision confirmed.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.010	12.5	FW	03/28/22	"Railway bridges do not appear to be in the DTX project scope. However, CHSR bridge criteria has substantially more requirements than AREMA, in particular a slew of Track-Structure Interaction requirements (i.e.: target structural frequency thresholds, track serviceability limits, RSI limits, and dynamic structural analysis limits)"	05/13/22	NLV	C	Section is speaking to any pedestrian bridges constructed, temporary bridges constructed, and Caltrans bridge modifications necessary for the project.	06/23/22	ROK	Agree, revision confirmed. Assuming no CHSR bridge part of project.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.011	12.9	FW	03/28/22	CHSR criteria infiltration limit is more stringent at 0.0002 gal/sf/day for all tunnels/underground structures with no "water tightness class" distinctions.	05/13/22	NLV	B	TJPA has prepared a project-specific design criteria in accordance with applicable codes. TJPA has reviewed the CHSRA against the DTX criteria and considers the DTX criteria provided acceptable practice.	06/23/22	ROK	Ok, I was only pointing out CHSR's more stringent infiltration limits for comparison.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.012	Section 12.2.1.2, 11-5	MBr	10/01/18	LEGACY Comment HSR18.046 - 11.2.1.2 Rail Live Loads - Muni new Siemen vehicle should be included.	02/28/22	MJS	A	Seimens' S200 SF Light Rail Vehicle (LRV) standard specifications (vehicle dimensions and weight) added for consideration/load calculations. Length over coupler: 75.0' Width: 104.32" Height with Pantograph: 11.5' Track gauge: 4'-8/5" Wheel Base: 6.2' (power trucks) Vehicle empty weight: 76,000lbs				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 123
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% Complete 100%

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Cal.001	Chapter 11	JP	04/29/22	coordinate chapter title and number	05/13/22	MM	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.002	Chapter 11	JP	04/29/22	(bullet) ACI 533.5R Guide for Precast Concrete Tunnel Segments	05/13/22	NLV	A	Will add reference to list of Codes & Standards in Chapter 13 Tunnels.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.003	Chapter 11.1	JP	04/29/22	reference project specifications	05/13/22	NLV	C	This section is stating minimum material properties for the designer to then create drawings and specs for.							05/13/22	CC
Cal.004	Chapter 11.1.8	JP	04/29/22	waterproofing to be designed by qualified expert with experience	05/13/22	NLV	B	Qualifications requirements are better suited to a Technical Requirements or Specifications document. Suggest to leave off Design Criteria, but include in Technical Requirements or Specifications.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.005	Chapter 11.1.8	JP	04/29/22	TJPA approval	05/26/22	MM	A	Revised as follows: "Underground structures must be designed to be completely waterproofed and must be approved by the TJPA."				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.006	Chapter 11.2.1	JP	04/29/22	include; AREMA	05/13/22	NLV	B	Not sure how AREMA is to be included in subsection 11.2.1 Loads and Forces. AREMA is already generally referred to in the parent section 11.2. Furthermore, loads listed in 11.2.1 are minimum loads augmenting what would be found in AREMA and AASHTO LRFD Tunnels + CBDS.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.007	Chapter 11.2.1.1	JP	04/29/22	revise; within the zone of influence, reference chapter 10	05/13/22	NLV	A	Comment later clarified. Will add suggested verbiages with slight word change for consistency with Chapter 10. Change complete.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.008	Chapter 11.2.1.1	JP	04/29/22	engineer to develop report for each existing building detailing source of building information, approximated dead and live loads, etc.; provide all existing building reports to TJPA for review	05/13/22	NLV	DE	Will evaluate. May be better suited to Specifications or Technical Requirements documents.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.009	Chapter 11.2.1.1	JP	04/29/22	revise; engineers existing building report	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.010	Chapter 11.2.1.1	JP	04/29/22	provide justification for 1,600 psf load	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision. 1,600 psf load meant to simulate load from future development and has been used in past projects. Will evaluate giving justifications for chosen value of future development load.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.011	Chapter 11.2.1.2	JP	04/29/22	reference standard or design guideline for values indicated	05/13/22	NLV	A	Muni Design Criteria added to Codes and Standards section				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.012	Chapter 11.2.1.2	JP	04/29/22	subheading; Impact Load	05/13/22	NLV	A	Comment later clarified. Agree. Change complete.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.013	Chapter 11.2.1.2	JP	04/29/22	reference standard or guideline	05/13/22	NLV	A	Added citation				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.014	Chapter 11.2.1.2	JP	04/29/22	move this sentence up to Impact Load	05/13/22	NLV	DE	Clarification of original comment and revision update will occur at next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.015	Chapter 11.2.1.2	JP	04/29/22	reference standard or guideline	05/13/22	NLV	DE	Comment later clarified to be in reference to Pedestrian Area Live Loads section. Pedestrian Area Live Loads section referenced substantially changed. Commenter to review new verbiage. Change complete.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.016	Chapter 11.2.1.2	JP	04/29/22	include; AREMA	05/13/22	NLV	C	Section already references AREMA for Caltrain.							05/26/22	CC
Cal.017	Chapter 11.2.1.4	JP	04/29/22	considering sea-level rise over service life	05/13/22	NLV	A	Agree. Will modify clause. Change complete.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.018	Chapter 11.2.1.4	JP	04/29/22	reference standard or guideline	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.019	Chapter 11.2.1.4	JP	04/29/22	TJPA approval	05/26/22	MM	A	Will add TJPA approval of variances is required.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.020	Chapter 11.2.2.1	JP	04/29/22	include additional information regarding protection of exposed structural steel elements; painting, galvanization, use of weathering or stainless steels, etc.	05/13/22	NLV	DE	Will evaluate. Design life is defined as 150 years as per AASHTO LRFD Tunnels. Designer will need to satisfy design life requirements.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.021	Chapter 11.2.2.2	JP	04/29/22	other reinforcing minimums per ACI or other referenced standards	05/13/22	NLV	DE	Section 11.2 is for cut-and-cover structures. Would first reference AASHTO LRFD Tunnels + CBDS + AREMA requirements. ACI requirements can be referenced in 11.6 buildings.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.022	Chapter 11.2.2.5	JP	04/29/22	engineer of record to approve location of all construction joints	05/13/22	NLV	A	Will include requirement. Change complete.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.023	Chapter 11.3.1	JP	04/29/22	revise; within zone of influence	05/13/22	NLV	A	Comment later clarified. Agree. Change complete.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.024	Chapter 11.3.2	JP	04/29/22	include; geotechnical engineer and	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.025	Chapter 11.3.2	JP	04/29/22	include; and conforming to the design parameters per section 10.2	05/13/22	NLV	DE	Need clarification on comment.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.026	Chapter 11.3.2	JP	04/29/22	designs for shoring supporting adjacent structures to be reviewed by TJPA	05/26/22	MM	A	Will add TJPA approval of variances is required.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.027	Chapter 11.3.2	JP	04/29/22	revise; 10 feet below the excavation depth, but not less than 2 feet.	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.028	Chapter 11.3.2	JP	04/29/22	subheading; Underpinning	05/13/22	NLV	A	Comment later clarified. Agree. Change complete.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.029	Chapter 11.4.6	JP	04/29/22	TJPA approve	05/26/22	MM	A	Will add TJPA approval of variances is required.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.030	Chapter 11.9	JP	04/29/22	this sentence appears to conflict with Table 11-3	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.031	Chapter 11.10	BZ	04/29/22	Specify the slope requirement of the positive drainage.	05/13/22	NLV	DE	Will evaluate.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC

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Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Noel Vivar (PMPC SME/Mott MacDonald)	NLV	Amanda Kaku (PMPC/HCI)	AK

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
Cal.032	Section 11.1.4	ZB	10/18/18	LEGACY Comment Cal18.034 - Section 11.1.4 Structural Steel Connections (highlighted text - "ASTM A449") May add ASTM F1554 for more suitable application.	02/28/22	MJS	A	ASTM F1554 "Standard Specification for Anchor Bolts, Steel, 36, 55, and 105ksi Yield Strength" will be added to the reference list.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.033	Section 11.2.1.2	ZB	10/18/18	LEGACY Comment Cal18.035 - Section 11.2.1.2 Rail Live Loads (third paragraph, highlighted text - "The effects of impact load associated with live load shall not be considered on base slabs that are in direct contact with earth unless they are pile-supported." For the direct fixation tracks, the design of the slab shall consider the live load impact. See AREMA Chapter 8 - 27.5.4.C.	02/28/22	NLV	A	Agree. Propose to remove the paragraph and let Designer follow AREMA.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.034	Section 11.2.1.12	ZB	10/18/18	LEGACY Comment Cal18.036 - Section 11.2.1.12 (second sentence, highlighted text - "..225 kips." Provide additional data to support the conclusion.	02/28/22	NLV	A	Agree. Clause removed and replaced with direction - designer to follow AREMA collision loading.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.035	Chapter 12 Section 12.1.1; (Page 12-3 of 22)	JP	06/30/22	5000psi shotcrete used for Tunnels per 334.1.1 SEM Draft Tunnel	09/02/22	NLV	B	Section is only giving minimum strengths. Designers are able to use a higher strength if they deem necessary.	10/05/22	JP	PMPC comment response is acceptable, comment is considered closed.	10/05/22	MJS	The responder (PMPC Team) received email notification from Caltrain (Pancoast) on 10/5 confirming acceptance of comment response.	10/05/22	CC
Cal.036	Chapter 12 Section 12.2.1.1, B; (Page 12-6 of 22)	JP	06/30/22	last sentence of first paragraph; revise 'Table 11.1' to Table 12.1	09/02/22	NLV	A	Table reference changed.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.037	Chapter 12 Section 12.2.1.1, E Existing Building Earth Surcharge; (Page 12-7 of 22)	JP	06/30/22	first sentence; revise 'Chapter 10' to Chapter 11	09/02/22	NLV	A	Chapter reference changed.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.038	Chapter 12 Section 12.2.1.1, E Adjacent and Future Development Earth Surcharge; (Page 12-7 of 22)	JP	06/30/22	The justifications for chosen value (1,600 psf) representing future development load shall be added to next revision.	09/02/22	NLV	B	TJPA has prepared a project-specific design criteria in accordance with applicable codes and local practice.	10/05/22	JP	PMPC comment response is acceptable, comment is considered closed.	10/05/22	MJS	The responder (PMPC Team) received email notification from Caltrain (Pancoast) on 10/5 confirming acceptance of comment response.	10/05/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 123
Comments Closed 123
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 12, Structures*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Andrew Baltay (Design Team/MJA)	AEB	Margaritte Bello (Design Team)	MB
Y. Sun (Design Team/MJA)	YS	Fletcher Waggoner (CHSRA)	FW
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Noel Vivar (PMPC SME/Mott MacDonald)	NLV	Amanda Kaku (PMPC/HCI)	AK

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
TA.001	Chapter 12, Structures (Scope)	LZ	07/04/22	Add a bullet: design of structures owned by others that may need to be modified as a result of the project	09/02/22	NLV	B	"facilicties owned by others" is covered in 2nd bullet in the current copy. Clarification needed.	10/05/22	LZ	TA would like to be clear that criteria include permanent structures/facilities in language	10/11/22	MJS	The second bullet under "Scope" has been revised as follows: "•Temporary structures and permanent facilities owned by others that are constructed or modified as part of the DTX project, including bridges, passenger stations, buildings, and miscellaneous structures." The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/11/22	CC
TA.002	Section 12.1.8, Waterproofing	LZ	07/04/22	Waterproofing design has to address potential leakage resulting from improper membrane installation	09/02/22	NLV	B	Improper constuction and installation repairs will be addressed in Specifications and Technical Requirements.	10/05/22	LZ	Based on experience, waterproofing is never perfect regardless of effort.	10/05/22	MJS	The responder (PMPC Team) has agreed to develop requirements for waterproofing system and failure repair procedures. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
TA.003	Section 12.1.8, Waterproofing (Third bullet)	LZ	07/04/22	Water barriers or waterstops?	09/02/22	NLV	A	Revised all references to element to "waterstops"				10/05/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/05/22	CC
TA.004	Section 12.1.8, Waterproofing (Second para)	LZ	07/04/22	States: "Where reinforced concrete is to be placed against the waterproofing membrane, no damage to the exposed membrane surface that would permit seepage through the membrane is allowed". This is the achilles heel of membrane waterproofing. Damage that is not easily detected and can esily occur, specially during rebar installation. If membrane waterproofing is to be used, there needs to be a requirement that very strict QA/QC procedures must be developed and monitored.	09/02/22	NLV	B	Improper constuction and installation repairs will be addressed in Specifications and Technical Requirements.	10/05/22	LZ	During CRM with SF CTA on 10/5, it was agreed that stringent quality requirements for the waterproofing system will be covered under technical specifications during the next phase of design.	10/05/22	MJS	The responder (PMPC Team) has agreed to develop requirements for waterproofing system and failure repair procedures. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
TA.005	Section 12.2.1.1, Permanent Loads (B. Superimposed Dead Loads) (Third para)	LZ	07/04/22	States: "In addition, in the absence of known loads and loading patterns of proposed CHSR OCS components and fixed equipment." This is incorrect. The CHSR loads and loading patterns are known, since they apply to the blended systen under which they will operate with Caltrain. CHSR will be using the Caltrain OCS components and fixed equipment	09/02/22	NLV	B	CHSRA DCM loading patterns are used as fallback and are referenced in this paragraph.	10/05/22	LZ	During CRM with SF CTA on 10/5, this presents confusion to reader - there will be no CHSRA specific equipment within the DTX ROW (other than the potential for CHSRA signaling approach).	10/05/22	MJS	The responder (PMPC Team) revised response during CRM on 10/5 and agreed to update per original comment; therefore this comment is considered closed.	10/05/22	CC
TA.006	Section 12.2.1.1, Permanent Loads (Adjacent and Future Development Earth Surcharge)	LZ	07/04/22	States ; "where there is potential for future development, use the surcharge from the actual development" If the development is potential, how could the actual surcharge from the development be used? Need a method to determine the potential surcharge based on zoning (eg, the maximum-size development allowed) or other means	09/02/22	NLV	A	Section re-written to specify unloading and loading scenarios.	10/05/22	LZ	During CRM with SF CTA on 10/5, resolution was met.	10/05/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/05/22	CC
TA.007	Section 12.2.1.1, Permanent Loads (F. Shrinkage - Table 12-2:Muni LRV Models)	LZ	07/04/22	The table and following text do not have an introduction as to the subject. It appears to be the Muni bridging structure, but there's no reference	09/02/22	NLV	B	Comment needs clarification. No table in current copy.	10/05/22	LZ	During CRM with SF CTA on 10/5, resolution was met with added table name.	10/05/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/05/22	CC
TA.008	Section 12.2.1.1, Permanent Loads (F. Shrinkage - Table 12-2:Muni LRV Models)	LZ	07/04/22	Add tare and crush-loaded weight to table	09/14/22	MJS	A	The weight scenarios AW0 (tare weight), AW1, (fully seated), AW2 (fully seated with moderate standing capatcity), and AW3 (crush load) will be provided under Table 12-2.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SF CTA agrees with suggest approach. Crush loaded weight must be used in design.	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC
TA.009	Section 12.2.1.1, Permanent Loads (First para after Table 12-2:Muni LRV Models)	LZ	07/04/22	Says use an LRV weight of 110,000 lbs, but does not say if that's the Breda or Siemens weight. Use the heavier.	09/14/22	MJS	A	Seimens S200 EMU tare weight is 76,000 (AW0), with seating for 60 people, total capacity of approx. 193 total passengers (assumes 6 people/m^2)	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SF CTA agrees with suggest approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC
TA.010	Section 12.2.2.4, Detailing (first bullet)	LZ	07/04/22	Specifies a maximum spacing of rebar but not a minimum. A minimum spacing should be specified to assure that the concrete aggregate can pass through.	09/02/22	NLV	B	Maximum spacing restricted beyond AASHTO LRFD Tunnels and ACI to control cracking. Minimum spacing as specified by AASHTO LRFD Tunnels and ACI are adequate; therefore, no additional requirement listed for minimum spacing.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.011	Section 12.2.2.4, Detailing (last bullet)	LZ	07/04/22	Need to specify the minimum wall thickness that the requirement of two layers of reinforcement applies to. Some walls may be of insufficient thickness to allow for concrete cover of rebar and appropriate spacing between the two layers of rebar.	09/02/22	NLV	B	Minimum wall thickness for two-layered walls will be defined by AASHTO LRFD Tunnels and ACI minimum spacing requirements. Minimum spacing as specified by AASHTO LRFD Tunnels and ACI are adequate; therefore, no additional requirement listed for wall thickness.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.012	Section 12.2.2.5, Joints (B. Construction Joints) (fifth sentence)	LZ	07/04/22	There are many types of waterstops, some more effective than others. Which types are recommended?	09/02/22	NLV	B	Waterstop requirements or definition are better suited to a Technical Requirements or Specifications document. Suggest to leave off Design Criteria, but include in Technical Requirements or Specifications.	10/05/22	LZ	During CRM with SF CTA on 10/5 - It was agreed that the waterstop type will be defined during the next phase of design in a technical specification/requirement.	10/05/22	MJS	The responder (PMPC Team) has agreed to define waterstop type and to develop requirements and specifications for waterstops. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
TA.013	Section 12.5, Bridges	LZ	07/04/22	Bridge criteria to be followed should include Caltrans	09/02/22	NLV	B	CBDS is already refereced in the current copy. Clarification may be needed for the comment.	10/05/22	LZ	During CRM with SF CTA on 10/5 - It was agreed that the intent of the comment was satisfied.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.014	Section 12.9, Watertightness and Leakage Mitigation	LZ	07/04/22	Although designing for watertightness, design should provide for collection and removal of any water infiltration due to failure of the waterproofing	10/01/22	MJS	A	Drainage and Plumbing system requirements in Chapter 16, Mechanical Systems is referenced and requires collection, conveyance, and removal of infiltrated water.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC
TA.015	Section 12.10, Drainage	LZ	07/04/22	Drainage system must be design to handle water infiltration over and above the allowable infiltration rates	10/01/22	MJS	A	Drainage and Plumbing system requirements in Chapter 16, Mechanical Systems is referenced and requires collection, conveyance, and removal of infiltrated water.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 99
Comments Closed 99
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 13, Tunnels*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Kush Chohan (Design Team/McMillan Jacobs Ass.)	CK	Y. Sun (Design Team/McMillan Jacobs Ass.)	YS
Peter Chou (Design Team/Parsons)	PC	Danny Lin (Design Team/Parsons)	DL
Bin Zhang (Caltrain)	BZ	Joel Pancoast (Caltrain)	JP
Eric Abrahamson (CHSRA)	EA	Elena Lasheras (CHSRA)	EL
S. Klein (CHSRA)	SK	Luis Zurinaga (SF CTA)	LZ
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Derek Penrice (PMPC SME/Mott MacDonald)	DP
Matt Schreffler (PMPC/Mott MacDonald)	MJS		

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DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment
PAR - Parsons to discuss internally

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Chapter 13 Scope, pg. 13-1	KC	12/10/21	Update the references for geotechnical parameters to latest geotechnical reports	05/02/22	DP	C	Geotech reports etc. are defined in Chapter 9, Geotechnical Requirements. Chapter 9 is referenced in the Scope section.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.002	Chapter 13 Codes, Standards and Guidelines, pg. 13-1	YS	12/10/21	Update for latest standards and add the following: American Concrete Institute (ACI). 2013. ACI 506.2 – Specification for Shotcrete. American Institute of Steel Construction (AISC). 2016. ANSI/AISC 360-16 – Specification for Structural Steel Buildings. ASTM International. ASTM A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.	05/02/22	DP	A	Agreed, ACI 506 is already included. Will add a generic reference to ASTM International. We're not going to list every applicable ASTM.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.003	Chapter 13 References, pg. 13-2	YS	12/10/21	Add the following: American Society of Civil Engineers. 2016. ASCE/SEI 7-16 – Minimum Design Loads for Buildings and Other Structures. The Concrete Society. 2007. Technical Report No. 63: Guidance for the Design of Steel-Fiber-Reinforced Concrete. John, Max, and Bruno Mattle. 2003. Shotcrete lining design: Factors of influence. In Proceedings of the Rapid Excavation and Tunneling Conference. 726–734. German Committee for Structural Concrete. 2015. DAfStb Guideline: Steel Fiber Reinforced Concrete. Bieniawski, Z.T. (1989). Engineering Rock Mass Classifications, New York: Wiley.	05/02/22	DP	A	Agreed, please note that the references list is not meant to be exhaustive or all-inclusive. The criteria states that 'appropriate' references may be used. This is left to the discretion of the EOR.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.004	Chapter 13 Section 13.1.1, pg. 13-2	YS	12/10/21	Add "Fiberglass dowels shall have a minimum tensile strength of 50 kips, conforming to ASTM D7205."	05/02/22	DP	A/B	See 13.1.3.4. Will modify strength from kips to an allowable stress to address different bar diameters.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	Chapter 13 Section 13.1.2, pg. 13-3	YS	12/10/21	Add "conforming to ASTM A615" behind "Lattice girders shall have a yield strength of 70ksi"	05/02/22	DP	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.006	Chapter 13 Section 13.2.5, pg. 13-4	YS	12/10/21	Clarify the loads for tunnel final lining associated with design fire event for tunnel fire-life safety	05/02/22	DP	A	The impacts on the lining need to be derived from ventilation analysis based upon the fire size and growth curve. This will show indicate the temperature growth in the lining versus time.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.007	Ch 13.1.3.4, Page 11-4 of 19	YS	04/08/22	Delete the word "face" as fiberglass dowels may also be used for temporary sidewall if a heading is divided into multiple drifts.	05/20/22	DP	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	Ch 13.1.6, Heading, Page 11-4 of 19	YS	04/08/22	Typo: Should be "Precast"	05/20/22	DP	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	Ch 13.5.3, 2nd Para., Page 11-13 of 19	YS	04/08/22	Suggest eliminating the use of shotcrete for tunnel final lining as it would create constructability issue associated with use of sheet waterproofing membrane.	05/20/22	DP	B	Understood, however there are areas where the use of shotcrete may be beneficial - such as the 2-3 track transition and within the adit, to offset unique formwork costs. Will leave as is.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	Ch 13.5.4, Page 11-13 of 19	YS	04/08/22	The concept of load sharing has been adopted by the industry. Elimination of this concept will result in over-design for the final lining and substantially increase the cost of construction. Suggest re-evaluating this requirement.	05/20022	DP	C	See response to comment HSR.018. This deserves further discussion. GEC should be prepared to provide examples of where load sharing has successfully been implemented (in CA, or similar seismic area); additional quality measures that would be implemented to ensure initial support shotcrete meets project design life requirements and how GEC intends to demonstrate that initial support retains its integrity after a maximum seismic event.	06/17/22	ROK	Comment Resolution Meeting (CRM) hosted by PMPC (Schreffler/Kaku) on 6/17/2022 with GEC/MJA (Y. Sun, K. Chohan, P. Chou, A. Beyabanaki, and R. Wong). The design team agrees with PMPC SME (D. Penrice) to not pursue load sharing at this point PENDING CHSRA Comment #HSR.029. Once the project delivery strategy is decided, this issue may be revisited. The design team will prepare a rough order of magnitude estimate of the difference in cost between currently-approved method and load-sharing method.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	Chapter 12	PC	09/12/16	LEGACY Comment GEC16.078 - Add a sub-section describing Design of Tunnel Portals requirements	05/02/22	DP	B	If the intent of section 11 is to cover cut and cover type structures then I would agree with it being covered there. In general other than the loads, load combinations the only thing specific to portals is the area required to prevent ear popping as the train transitions into the smaller space. In our case due to the speed going around the curve from 7th to Townsend, and the fact we have a station not far beyond the portal, the train will be at low enough speed that this shouldn't matter.	05/04/22	ROK	Understood. Also was thinking a performance requirement for type of joint (portal-to-trench, or portal-to-cut&cover), but also understand this can be decided by final designer. I assume we won't have a flood gate here, so I assume no design criteria is needed (if yes, then ROK).				05/04/22	CC
GEC.012	Chapter 12	PC	09/12/16	LEGACY Comment GEC16.079 - Add a sub-section describing Tunnel Waterproofing design requirements	05/02/22	DP	A	Agree with need for waterproofing/infiltration limits. The waterproofing will describe only where it's required. The majority of the requirements should be in the specifications.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.013	Section 12.8.1	PC	09/12/16	LEGACY Comment GEC16.080 - Need to make sure TJPA and JA (design team) agree with the load sharing concept, and if yes, the method to analyze load sharing.	05/02/22	DP	C	We had agreed the concept of load sharing between the initial support and final lining for SEM driven tunnels with JA. We can take another look at this based on the comment above if that's JA's current recommendation. Given the amount of temporary steelwork - rock bolts etc. that's within the temporary support it's hard to guarantee its durability for the design life of the project.	05/04/22	ROK					05/04/22	CC
GEC.014	Chapter 12	KA		LEGACY Comment GEC18.064 - There are no criteria for TBM or segmental liner design. Things like gasket requirements, segment reinforcing. Segments envisioned are not permanent elements but would need to be design as temporary support.	05/02/22	DP	A	Agree with comment, we should include requirements for segmental lining design if TBM driven tunnels are proposed. As suggested in the comment, if these are only for temporary purposes we wouldn't be overly prescriptive on gaskets and connectors.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.015	Sect. 12	YS		LEGACY Comment GEC18.065 - This section needs to include the requirements for the TBM tunnel design and construction.	05/02/22	DP	A	The preferred approach for Concept C Reduced "CRED" is a single-bore Sequential Excavation Methodology (SEM). TJPA/IPMT/ESC are working to approve. Suggest including requirements per GEC18.064 comment if this is appropriate.	05/04/22	ROK	No further comment.				05/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 99
Comments Closed 99
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 13, Tunnels*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Kush Chohan (Design Team/McMillan Jacobs Ass.)	CK	Y. Sun (Design Team/McMillan Jacobs Ass.)	YS
Peter Chou (Design Team/Parsons)	PC	Danny Lin (Design Team/Parsons)	DL
Bin Zhang (Caltrain)	BZ	Joel Pancoast (Caltrain)	JP
Eric Abrahamson (CHSRA)	EA	Elena Lasheras (CHSRA)	EL
S. Klein (CHSRA)	SK	Luis Zurinaga (SF CTA)	LZ
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Derek Penrice (PMPC SME/Mott MacDonald)	DP
Matt Schreffler (PMPC/Mott MacDonald)	MJS		

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GEC.016	Sect. 12	YS		LEGACY Comment GEC18.066 - The geotechnical design parameters were subsequently developed by JA in the Ground Characterization memo not the cited draft GIR.	05/02/22	MJS	A	The Scope section has been revised to include the following: •Final Geotechnical Interpretive Report, Part I, Soil and Rock Characterization for Mined Tunnel Design for the Caltrain Downtown Extension by Parsons Transportation Group, San Francisco, dated April 30, 2010 •Final Geotechnical Interpretive Report, Part II, Design Recommendations for the 30% Preliminary Engineering Design Phase of the Cut-and-Cover Segment of the DTX Alignment for the Caltrain Downtown Extension by Parsons Transportation Group, San Francisco, dated May 18, 2010 •Task 7.01, Ground Characterization Update – Preliminary Design Phase, Caltrain Downtown Extension, by Jacobs Associates, dated May 22, 2009 DP 05/25/22 - I don't see where these are included in the Scope section, nor on reflection do they need to be here. The reports should be referenced/listed in the Geotechnical chapter only. The reference we have to Chapter 9 within the Tunnels scope section is fine.	05/04/22	ROK	According to the current plan, the MJA's Ground Characterization TM will be included in the final GIR. Comment closed.				05/04/22	CC
GEC.017	DC 12. Scope	PC		LEGACY Comment GEC18.067 - Scope: change the references to geotechnical reports; maybe delete Arup and date?	05/02/22	MJS	A	The Scope section has been revised to include the most recent, Final GIRs. DP 05/25/22 - See my additional comment on the previous line. No sign of Geotech Report references in scope, which is fine, but responses should be updated.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.018	DC 12. Scope	PC		LEGACY Comment GEC18.068 - Codes, Standards and Guidelines: Add code references to precast concrete segment and steel fibers	05/02/22	DP	A	Agree with comment, we can add ACI references for segmental lining design and fiber reinforced segments.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.019	DC 12.1	PC		LEGACY Comment GEC18.069 - Add "Soil Reinforcement: fiberglass face dowels"	05/02/22	DP	C	Suggest we take another look at the requirements we've provided for what are essentially temporary support requirements, that may be better limited to specifications. If we want to keep such requirements in the design criteria then I agree with the comment.	05/04/22	ROK	Agree to use specification for non-critical temporary elements.				05/04/22	CC
GEC.020	Sect. 12.1.2	YS		LEGACY Comment GEC18.070 - Suggest including weld wire fabric, steel fiber, and macro synthetic fiber as part of initial shotcrete lining reinforcement materials.	05/02/22	DP	A	Agreed, design criteria to include weld wire fabric, steel fiber, and macro synthetic fiber as part of the initial shotcrete lining reinforcement materials.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.021	Sect. 12.2.3, Bullet c	YS		LEGACY Comment GEC18.071 - The ground loads for soft ground tunnels appear inconsistent. Should the ground arching be taken into account, the design would not consider the full overburden. Need clarification.	05/02/22	DP	A	Agreed. The requirements in this section appear empirical. We should modify and base ground loads from numerical modeling.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.022	Sect. 12.2.3, Bullet d	YS		LEGACY Comment GEC18.072 - Even for rock tunnels, the ground loads may depend on the rock quality. Specifying a ground load limit equal to 1 times the span for rock tunnels may or may not result in underestimating the ground loads. Suggest revising.	05/02/22	DP	A	Agreed, see GEC18.071 comment response.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.023	12.4 Table 12.2	KA		LEGACY Comment GEC18.073 - Tunnel distance to existing buildings is not meaningful. The as designed passes under existing buildings and the 10ft requirement is not possible to meet with a TBM option. I've seen requirements like this for buildings constructed after the tunnel is built. Suggest removing or modifying this requirement.	05/02/22	DP	A	Agreed. This has been removed.	05/04/22	ROK		05/09/22	DP	PMPC SME agrees with original comment, updated as noted - consider comment closed	05/09/22	CC
GEC.024	Sect. 12.5, Table 12.2	YS		LEGACY Comment GEC18.074 - The limits specified should be updated as some of them cannot be met due to the revised mining options in certain areas. By relaxing the limits, requirements for mitigation to limit the impact and potential damages to adjacent buildings or structures should be specified.	05/02/22	DP	A	Agreed. See response to GEC18.073. Table has been deleted.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.025	Table 12.2	DL		LEGACY Comment GEC18.075 - Suggest adding the word "foundation" at the end of the title for Table 12.2 so that it reads "Table 12.2, Clearance Requirements for Tunnel Relative to Existing Building Foundations."	05/02/22	MJS	A	Per previous comments, Table has been deleted.	05/04/22	ROK					05/04/22	CC
GEC.026	DC 12.5 & Table 12.2	PC		LEGACY Comment GEC18.076 - The minimum clearance needs to be revised. For example, TBM+SEM width along Townsend Street and near Fourth Street is about 71 to 75 ft or so, and vertical clearance is less than 20 to 25 ft and horizontal clearance at one corner (Safeway) is less than 5 ft (to pile foundations).	05/02/22	DP	A	Agreed. See response to GEC18.073/074. Table has been deleted.	05/04/22	ROK					05/04/22	CC
GEC.027	Sect. 12.7, 1st Paragraph	YS		LEGACY Comment GEC18.077 - Suggest including (1) macro synthetic fibers as reinforcement material for initial shotcrete lining, (2) face dowels if required, (3) pipe canopy as presupport, and (4) TBM segments as part of initial or temporary support for the mined tunnels.	05/02/22	DP	A	Agreed - will update section accordingly.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.028	Sect. 12.7.1	YS		LEGACY Comment GEC18.078 - Suggest adding a bullet about in situ stress conditions which are also critical in estimating the ground movements and ground loads.	05/02/22	DP	A	Agree with comment. Suggest we move away from providing load diagrams, this is also a bit empirical. We should be moving towards numerical modeling and defining the requirements of the modeling - to address the variations in stratigraphy and in situ conditions as suggested by GEC18.079.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.029	Sect. 12.7.2, Ground conditions	YS		LEGACY Comment GEC18.079 - Suggest adding a bullet under "ground conditions" about in situ stress conditions which are also critical in estimating the ground movements and ground loads. Also, indicate the importance of addressing the potential uncertainties in ground condition characterization by considering sensitivity analyses for variations of ground conditions along the alignment. These sensitivity analyses will be used for defining toolbox initial support measures.	05/02/22	DP	A	Agreed - added bullet. Requirements for sensitivity analysis are included in Section 12.4.1	05/04/22	ROK	No further comment.				05/04/22	CC

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GEC.030	Sect. 12.7.2, Construction parameters	YS		LEGACY Comment GEC18.080 - Suggest adding a bullet under "construction parameters: about need for pre-support or ground improvement.	05/02/22	MJS/DP	A	Modified second bullet to read as follows: "Need for face support, pre-support, or ground improvement measures" (DP) Agree with comment. I'd suggest the entire section needs a bit of a rethink. It's a bit out of date in comparison with say LA Metro or BART criteria.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.031	Sect. 12.7.2, Last paragraph	YS		LEGACY Comment GEC18.081 - Suggest also stressing the importance of controlling ground movements or surface settlements especially in the areas adjacent to existing structures.	05/02/22	MJS/DP	A	Please note that DTX Design Criteria Chapter 10 - Protection of Existing Infrastructure is also being updated. (DP) Agree with draft response. Added to bullet 3 of 2n bulleted list in 12.5.1. We can deal with ground movement/building settlement issues in Section 10.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.032	DC 12.7.2	PC		LEGACY Comment GEC18.082 - The analysis needs to include the languages to TBM liner.	05/02/22	DP	A	Agreed - will update section accordingly.	05/04/22	ROK					05/04/22	CC
GEC.033	Sect. 12.8	YS		LEGACY Comment GEC18.083 - Suggest indicating the tunnel is designed as undrained with watertightness requirement for the final lining.	05/02/22	DP	A	Agreed - infiltration criteria to be included as part of the waterproofing section.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.034	Sect. 12.8.1, 3rd bullet	YS		LEGACY Comment GEC18.084 - Suggest including steel ribs if used as part of initial support elements which should be excluded from the load sharing consideration.	05/02/22	DP	A	This section will be modified to not permit load sharing between initial support and final lining in design/analysis	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.035	Sect. 12.11, last sentence	YS		LEGACY Comment GEC18.085 - Do we permit any unsupported ground even though the tunnel stability would not be an issue? For workers' safety, we may require installation of a minimum support before any worker could go under. This may be addressed in Section 12.7.	05/02/22	DP	A	This is a specification issue, not really necessary for a DCM. However, added some text to 12.10 Cal/OSHA requirements	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.036	Sect. 12.14	YS		LEGACY Comment GEC18.086 - The following two items should also be addressed in the shaft excavation and support design: (1) Impact of the shaft excavation to adjacent structures if existing (2) Effect of breakout into an adit/crossover cavern from the shaft on the shaft support system	05/02/22	DP	A	(1) Would be addressed in Section 10 (2) Yes, agreed we should address that.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.037	Figure 12.1	YS		LEGACY Comment GEC18.087 - The lateral earth pressure Ph should be extended to the total height Ht of a tunnel.	05/02/22	DP	A	Agree with comment, but we should delete the figure. We should update the criteria to focus more on numerical modeling requirements.	05/04/22	ROK	No further comment.				05/04/22	CC
Cal.001	Chapter 13	BZ	04/21/22	include; AREMA	05/02/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Chapter 13 - 13.1.1	BZ	04/21/22	Concrete must conform to ACI 301 and ACI 304R. Concrete materials shall meet all applicable ASTM specifications.	05/02/22	DP	A	Will add ACI 301 reference. This is a design criteria, it's not intended to be a specification. These will be prepared separately. ASTM requirements are called out in individual sections as needed.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.003	Chapter 13 - 13.1.2	BZ	04/21/22	Shotcrete materials shall meet ASTM C1436.	05/02/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.004	Chapter 13 - 13.1.6	BZ	04/21/22	revise section title to 'Precast'	05/02/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.005	Chapter 13 - 13.1.6	BZ	04/21/22	provide AASHTO or ASTM gasket specifications	05/02/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.006	Chapter 13 - 13.2	BZ	04/21/22	revise font to lower case; revise sentence to clarify subsections.	05/02/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.007	Chapter 13 - 13.2.9	BZ	04/21/22	Protective measures must be approved by the TJPA and PCJPB.	05/02/22	DP	A	Ok, will add TJPA only since they will have contractual relationship with Contractor.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.008	Chapter 13 - 13.5	BZ	04/21/22	revise referenced section number to 12.4	05/03/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.009	Chapter 13 - 13.5.2	BZ	04/21/22	Geotechnical engineer to approve selected factors of safety.	05/03/22	DP	A	Text will be added per recommendation. DP 05/25/22: I can't find any reference to selected factors of safety in 13.5.2/12.5.2. Need to confirm where and what this is referring to.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.010	Chapter 13 - 13.6.1	BZ	04/21/22	'high strength cementitious grout'	05/03/22	DP	C	No, it's not. It can be as low as 150 psi or thereabouts.				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.011	Chapter 13 - 13.8.4.2	BZ	04/21/22	omit 'used'	05/03/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.012	Chapter 13 - 13.9.2	BZ	04/21/22	omit additional text spaces	05/03/22	DP	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.013	Chapter 12	BZ	10/18/18	LEGACY Comment Cal18.037 - Chapter 12 Tunnels (general) Any design guideline/criteria for tunnel waterproofing?	05/02/22	DP	A	Basic requirements for the waterproofing extent will be added in section 12.1.5, per response to GEC16.079. Infiltration limits are included as 12.9. Waterproofing material requirements will be within specifications.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.014	Section 12.7.2	BZ	10/18/18	LEGACY Comment Cal18.038 - Section 12.7.2 Analysis (Construction Parameters: bullet eight - "Waterproofing between initial support and final lining" Any design guideline/criteria for tunnel waterproofing?	05/02/22	DP	A	To be added in section 12.1.5 and 12.9, per response to GEC16.079.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.015	Chapter 13 Section 13.5.4; (Page 13-14 of 20)	JP	06/30/22	Load sharing between the temporary construction support and the final lining of the mined tunnel shall be justified by analysis and approved by TJPA prior to NTP for final design. (reference MINED Tunnel Design Preliminary Engineering Technical Memorandum 334.1.1)	08/19/22	DP	C	Please refer to comment GEC.010 above, and the resolution with the GEC. There is no way the integrity of the initial support can be verified after the maximum seismic event.				10/04/22	MJS	See response to comment GEC.010 above. We met with the GEC to discuss load sharing, with the intent of determining how we can verify the integrity of the initial support after a maximum seismic event, which it is not designed to withstand, and trying to understand the cost implications of the criteria. Per that comment we may revisit this issue later. As stated, this could also be proposed as a VE savings though that too would need to address post-seismic event support integrity. The responder (PMPC Team) has agreed to investigate load sharing concepts during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC

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HSR.001	Section 13.1, p. 2	SK	03/28/22	Suggest deleting "temporary" and reword to say "used for initial support and final lining of tunnel excavations".	05/03/22	DP	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.002	Section 13.1.1, p. 3	SK	03/28/22	Refer to ACI 318 and other pertinent ACI references for other requirements like aggregates, admixtures, etc.	05/03/22	DP	A	Ok, added specific reference to ACI 301.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.003	Section 13.1.6, p. 4	SK	03/28/22	First word in title is misspelled, the "P" in precast is missing.	05/03/22	DP	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.004	Section 13.1.6, p. 5	SK	03/28/22	Gasket material specifications should be provided like ASTM C920, ASTM D412, etc.	05/03/22	DP	B	Our intent isn't to provide a list of ASTM'S within the DCM. They can be addressed within specs. ASTM C920 relates to poured joint sealant, is that a typo?	06/21/22	BCC	Response not acceptable. In Section 13.1.4.2, two paragraphs above, two ASTM sections are listed for lattice girders (A615 and A36) and these are for initial support only. The gaskets have several very general requirements aimed at ensuring adequate gasket performance for design life. For consistency, provide applicable ASTM references to achieve gasket durability for 100 year design life.	08/19/22	DP	Revised the first sentence of Section 13.6.1: "Precast tunnel lining segments must include perimeter gaskets conforming with ASTM C920 and D412 to prevent waterflow through joints." The responder (PMPC Team) agreed to update per backcheckcomment response; therefore this comment is considered closed.	10/12/22	CC
HSR.005	Section 13.2, p. 5	SK	03/28/22	First sentence needs to be corrected. AASHTO LRFD Tunnel spells out load combinations that should be considered. Second paragraph is too vague. Unless the load combinations are provided herein, revise to specifically refer to AASHTO LRFD Tunnel for requirements.	05/03/22	DP	A	Will clarify. Intent is that AASHTO load combinations are adopted. Second paragraph relates to permanent loads, the title of which is caught up in the first paragraph.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.006	Section 13.2.1, p. 5	SK	03/28/22	Dead loads should also include the weight of elements attached to the final lining such as the OCS system, communications, pipes, etc.	05/03/22	DP	A	Agreed, these are defined in 13.2.1 as superimposed dead loads. Will clarify.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.007	Section 13.2.3. p. 5	SK	03/28/22	Shouldn't design ground loads be given in the Geotechnical Baseline Report (GBR). There should be an interpretive geotechnical report that defines the ground loads and groundwater pressures for design.	05/03/22	DP	C	Ground loads will not be provided in the GBR. For a DB or other alternative procurement, these will be developed by the Geotechnical Engineer of Record. Parameters used as part of the Preliminary Engineering can be provided as a reference document.	06/21/22	BCC	Do not agree that it should be up to Geotechnical Engineer of Record to determine design ground loads. The Owner has a vested interest in making sure that lining is designed properly. GBR should indicate minimum design ground loads that must be complied with.	08/19/22	DP	There are many examples of GBR's without minimum design ground loads - LA Metro Measure R Projects, Sound Transit East Link, Northgate Link, U-Link, BART Silicon Valley Extension just to name a few. With the exceptioon of BSVII, these projects have been constructed, with proper lining design. There is significant opportunity for design parameters developed by the Geotechnical EOR to be reviewed for their appropriatenesss. The responder (PMPC Team) will investigate the merits of including minimum design ground loads as a requirement for the GBR during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
HSR.008	Section 13.2.3. p. 6	SK	03/28/22	Under d., design rock loads should also consider the weight of unstable rock blocks and wedges daylighted by the tunnel excavation. These blocks/wedges may be point loads on the lining and may be eccentric loads.	05/03/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.009	Section 13.2.3. p. 6	SK	03/28/22	Under g., ground-structure interaction models do not determine the loads acting on tunnel linings but they can be used to evaluate the lining stresses for a certain tunnel geometry, ground condition (including the physical properties associated with these conditions), and groundwater regime.	05/03/22	DP	A	Will remove references to ground loads.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.010	Section 13.2.11, p. 7	SK	03/28/22	Does the "Threat and Vulnerability Assessment" provide blast loading criteria? Specific blast loading criteria should be provided if this loading is to be considered in tunnel design.	05/03/22	DP	B	It is the intent that blast requirements will be presented within the T&VA. This will be a security sensitive document. The criteria will not be included in the DCM.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.011	Section 13.2.13, p. 8	SK	03/29/22	Segmental linings should also be designed for construction loads due to handling, stacking, transporting, lining erection, and TBM advancement (thrust jack loads).	05/03/22	DP	A	They are all construction loads, and there is a requirement that the lining accommodate construction loads per 12.2.8. The load conditions described are also explicitly addressed within AASHTO. However, will add, as clarification.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.012	Section 13.4, p. 8	SK	03/29/22	Should identify load combinations from AASHTO LRFD Tunnel that need to be considered. Evaluate if there are other load combinations that must be addressed.	05/03/22	DP	A	All of them, this is implicit by the use of the code. Will clarify.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.013	Section 13.4.1, p. 9	SK	03/29/22	In last paragraph, delete "comparison… comparable projects". Such a comparison is not a valid approach to checking modeling results for DTX project. There could be an error with inputs that would not be picked up.	05/03/22	DP	C	The comparison is valid. For similarly sized excavations in similar ground conditions - if the results are significantly different, then further investigation may be required (of both projects), which isn't a bad thing. It's not the intended to represent the primary method of design checking. Have modified text to reflect that this can only supplement alternative analysis methods.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.014	13.5.1, p. 11	SK	03/29/22	In second group of bullets, modify third bullet to say "ensure stability and control ground movements at each stage".	05/03/22	DP	A	Ok, will add.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.015	13.5.1, p. 11	SK	03/29/22	In last paragraph, revise "and load combinations comparable to those applied for the final lining". Some load combinations applied to final lining involve long-term operations (i.e. fire, blast loading, etc.) which would not be relevant load combinations for the initial support system by itself. Better to identify specific load combinations for design of initial support systems.	05/03/22	DP	A	Will review the wording. Note that the first sentence uses 'applicable' before load combinations, and the second sentence defines that extreme loads - which includes fire and blast in the AASHTO, need not be applied, with the exception of seismic.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.016	13.5.2, p. 13	SK	03/29/22	In the second bulleted list and second to last paragraph, the term "outer lining" is used. Does this refer to initial support or final lining? Please clarify.	05/03/22	DP	A	13.5.2 relates to initial support. Will replace 'outer lining' with 'initial support'.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.017	13.5.3, p. 13	SK	03/30/22	Refer to ACI 544.7R for design of fiber reinforced tunnel segments.	05/03/22	DP	A	Noted. This is listed in the standards at the start of the section. Section 12.5.3 is exclusive to final lings of mined tunnels. Also note that per 12.6.1, segments reinforced with fiber only are not currently permitted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 99
Comments Closed 99
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 13, Tunnels*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Kush Chohan (Design Team/McMillan Jacobs Ass.)	CK	Y. Sun (Design Team/McMillan Jacobs Ass.)	YS
Peter Chou (Design Team/Parsons)	PC	Danny Lin (Design Team/Parsons)	DL
Bin Zhang (Caltrain)	BZ	Joel Pancoast (Caltrain)	JP
Eric Abrahamson (CHSRA)	EA	Elena Lasheras (CHSRA)	EL
S. Klein (CHSRA)	SK	Luis Zurinaga (SF CTA)	LZ
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Derek Penrice (PMPC SME/Mott MacDonald)	DP
Matt Schreffler (PMPC/Mott MacDonald)	MJS		

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.018	13.5.4, p. 13	SK	03/30/22	Neglecting load sharing for a SEM tunnel is very conservative. Typically for a tunnel this size, the thickness of the initial support shotcrete will be significant and some of it should be effective for long-term ground support. This requirement should be re-evaluated.	05/03/22	DP	C	The previous version of the DTX Criteria did allow load sharing between the initial support and final lining. Ultimately omitting the load share component is not that conservative. The initial support is penetrated regularly by spiles and other temporary steelwork. It is not designed for the ODE or MDE events. Ensuring it's durability for the 100 year project design life or its integrity after an ODE/MDE event is questionable. The quality of initial lining shotcrete installation would also need to improve significantly prior to accepting this condition - which would necessitate more rigorous quality assurance and control during construction, at a cost premium. Load sharing was not permitted for Chinatown Station, nor for the Regional Connector Cavern, nor for the Sound Transit Bellevue Tunnel. Caltrans Devils Slide tunnels assume deterioration of the initial support and that all loads be supported by the final lining. At this scale the arch final lining is typically thicker than would be required for strength design alone, to accommodate placement of concrete. The cost implications from ignoring a contribution of the initial support are not that great.	06/21/22	BCC	It seems like load sharing with the intial support system could be utilized to safely achieve some cost savings. It is noted that the final lining is 18 to 21 inches thick and reinforced with steel rebar mats on each face. This lining thickness is more than enough for constructability. The initial shotcrete layers may be subject to long-term degradation but subsequent layers would be protected and would not be penetrated by spiling or other rock reinforcement. This is something that may be of interest from a value engineering standpoint.	08/19/22	DP	See response to comment GEC.010 above. We met with the GEC to discuss load sharing, with the intent of determining how we can verify the integrity of the initial support after a maximum seismic event, which it is not designed to withstand, and trying to understand the cost implications of the criteria. Per that comment we may revisit this issue later. As stated, this could also be proposed as a VE savings though that too would need to address post-seismic event support integrity. The responder (PMPC Team) has agreed to investigate load sharing concepts during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
HSR.019	13.6.3, p. 14	SK	04/01/22	For joint design, reference ACI 533 and PAS 8810:2016 "Tunnel Design-Design of Concrete Segmental Linings-Code of Practice", British Tunneling Society.	05/03/22	DP	A	ACI 533 is listed as a reference standard at the start of the Section. Will add PAS as reference document.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.020	13.7, p. 15	SK	04/01/22	First paragraph refers to the "Geotechnical Interpretive Report". What about the Geotechnical Baseline Report? Will a GBR be prepared?	05/03/22	DP	A	There will be a GBR. Text modified to remove reference to the GIR and to state that recommendations are to be provided by the EOR.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.021	13.8.3, p. 16	SK	04/01/22	Second paragraph indicates rebar spacing must not exceed 12 inches or 1.5 times the lining thickness. Add ", whichever is less" to this sentence.	05/03/22	DP	A	Ok.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.022	13.8.4.1, p. 16	SK	04/01/22	How much movement does an interface joint have to be designed for? Chapter 10 mentions some dynamic modeling but it is not clear how this should be done.	05/03/22	DP	A	Will clarify. I don't believe the GEC has performed any analysis that would indicate the magnitude of the joint movement, however, based on work done elsewhere in the Bay Area the calculated movement will likely be in the range of a couple of inches. Will clarify that the design joint movement needs to be that calculated from numerical modeling, plus an increment/factor.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.023	13.9, p. 17	SK	04/01/22	The first sentence indicates groundwater inflows are to be minimized by the use of "relatively impervious shotcrete linings". Why not rely on waterproof membranes? This is a much more positive way to avoid groundwater inflows. How about where precast concrete segmental linings are used? Please revise.	05/03/22	DP	A	The first sentence clearly states 'during construction'. Para 3 starts to discuss the use of membrane for the completed tunnel. Will try and clarify requirements for mined tunnels versus bored, though requirements for bored tunnels are in 12.9.2.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.024	13.9, p. 17	SK	04/01/22	Considering some of the impacts of dewatering at the transit center, why would TJPA allow leakage into the tunnel at all? This section is redundant, poorly organized, and confusing. The objective should be a watertight tunnel which is not clear the way this is written.	05/03/22	DP	A	Will clarify language. The statement re-dewatering impacts at the Transit Center is not clear - how does dewatering or pumping hundreds/thousands of gpm compare with infiltration in the amount of a few gpd? DTX does require a waterproofing membrane, or equivalent. Despite these, infiltration will still occur, hence the additional/allowable criteria is prudent. The infiltration criteria provided are quite onerous and should not impact system durability. Zero infiltration is not realistically achievable.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.025	13.1.1	EA	04/19/22	Cast-in-place concrete requirements for CHSR are different, requiring 4000 to 5000 psi depending on application. Refer to CHSR criteria for details.	05/03/22	DP	C	The objective for DTX is that the structures provided be durable for 100 years. I'm not sure that there is a requirement that the DTX and CHST criteria have identical requirements. We have specified 4,000psi as a minimum for cast in place concrete. The designer may elect to use 5,000 psi concrete if they choose.	06/23/22	ROK	Ok, I was only pointing out the difference between CHSR & DTX criteria.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.026	13.1.2	EA	04/19/22	CHSR design criteria specifies that steel fibers be excluded from 1 inch of shoterete cover where adjacent to waterproof membranes.	05/03/22	DP	B	Ok. This is not necessarily consider that a 'design criteria' as opposed to a performance requirement that'd be addressed within the technical specifications. CHSRA is requiring an unreinforced or smoothing shoterete layer which is fairly typical.	06/23/22	ROK	Ok, I was only pointing out the difference between CHSR & DTX criteria.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.027	13.1.3.4	EA	04/19/22	Fiberglass dowel strength is specified to be 50 kips. CHSR design criteria specifies the strength as 70 ksi. So, so sqrt(4*50/70/pi) = 0.95", so is the assumed dowel diameter 1" ? Dowel strength varies with diameter.	05/03/22	DP	A	We appreciate the strength varies with diameter. Will modify requirement to 70ksi.	06/23/22	ROK	Agree.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.028	13.2.10, 13.2.3 i	EA	04/19/22	Flood return period not specified in 12.2.10. 12.2.3 i says to design for temporary load conditions, including the 100-year flood. CHSR design criteria specifies design for 500-year flood.	05/03/22	DP	C	Flood elevations are defined in Section 04 - Environmental Requirements. There's no need to repeat these here.	06/23/22	ROK	Ok, I didn't have Chapter 4 @ time of original review.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.029	13.5.4	EA	04/19/22	"Load sharing between initial support and the final lining is not permitted" This conflicts with Section 12.5.3 next to last paragraph "final linings must consider a condition whereby the ground load is taken by the initial support but the groundwater load is acting upon the tunnel" If the initial lining carries soil load while the final lining carries groundwater pressure, that's load sharing. Recommend brief explanation why provision of 12.5.4 needed ? CHSR allows load sharing, with up to 35% of soil load carried by the initial lining, and 100% of groundwater pressure on the final lining.	05/03/22	DP	DE	It is not a conflict. There is a reasonable expectation that the initial support will degrade over time. However, when first installed there is a reasonable expectation that the initial support will continue to support ground loads. The initial support is not designed for hydrostatic pressures, which are assumed to be supported by the final lining. This is a condition that can result in different effects on the final lining than the assumption that the lining carries all ground/water loads and cannot be ignored. See response to HSR.018. The requirements in the CHST Criteria are similar to those that were in the DTX Criteria in 2009. We'v since realized through practical application, that the load share concept in practice is not straightforward.	06/23/22	ROK	Comment no longer applies. In June 1, 2022 Section 13.5.4 states "Load sharing between the initial support and the final lining is not permitted."	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**99**
Comments Closed	**99**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 13, Tunnels*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Kush Chohan (Design Team/McMillan Jacobs Ass.)	CK	Y. Sun (Design Team/McMillan Jacobs Ass.)	YS
Peter Chou (Design Team/Parsons)	PC	Danny Lin (Design Team/Parsons)	DL
Bin Zhang (Caltrain)	BZ	Joel Pancoast (Caltrain)	JP
Eric Abrahamson (CHSRA)	EA	Elena Lasheras (CHSRA)	EL
S. Klein (CHSRA)	SK	Luis Zurinaga (SF CTA)	LZ
Responders			
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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.030	13.2.10	EL	04/19/22	No design requirements found in this chapter related to Base Flood Elevations. Critical facilities for CHSR, such as tunnel portal sites and facilities, and vent structures shall be designed so that the finish floor elevation or top of slab foundation of these facilities are a minimum of 2 feet above 100-year floodplain or six inches above 500-year floodplain, whichever is greater.	05/03/22	DP	C	Flood elevations should/will be defined in Section 04 - Environmental Requirements. There's no need to repeat these here. We agree with the need to define freeboard requirements at portals and other penetrations into the tunnel, but these are not requirements of stations and cut and cover structures, not the mined tunnel.	06/24/22	BCC	Chapter 04 (Environmental requirements) was not provided originally to CHSRA for review. Chapter 4 in the DTX design Criteria Manual Rev Book 02 Draft Final document refers to chapter 5 (Civil Design) for requirements related to flooding. And the requirements included in chapter 5 do not comply with CHSRA requirements indicated in the original review comment. Please revise to incorporate the following: Critical facilities, such as tunnel portal sites and facilities, and vent structures shall be designed so that the finish floor elevation or top of slab foundation of these facilities are a minimum of 2 feet above 100-year floodplain or six inches above 500-year floodplain, whichever is greater.	10/19/2022	MJS	The responder (PMPC Team) recognizes that critical facilites must be designed for flood mitigation. Revisions have been made to address this issue in the relevant chapter/section; therefore this comment is considered closed. Section "4.5 Sea Level Rise and Floods" has been revised as follows: The project's critical flood inundation elevation of +13.32 feet (NAVD88) factors in sea-level rise over the 100-year life cycle of the project or 2 feet above the 100-year floodplain elevation, whichever is greater Critical facilities, such as the tunnel portal and vent structures, must be designed so that the finish floor elevation or top-of-slab foundation are compliant with the criteria. Where this is not feasible, reasonable flood mitigations must be implemented. As approved by TJPA. Where portions of the project are within the 100-year floodplain or may be affected by other portions of the project within the 100-year flood plain, the drainage facilities must be designed for the 100-year flood condition."	10/19/2022	CC
HSR.031	13 (whole chapter)	EA	06/23/22	The structures chapter was changed from chapter 11 to chapter 12. There are many references to chapter 11 sections which should be chapter 12 sections.	08/19/22	DP	A	Editorial – PMPC Team to update.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.032	13 (whole chapter)	EA	06/23/22	The seismic chapter was changed from chapter 13 to chapter 10. There are many references to chapter 13 sections which should be chapter 10 sections.	08/19/22	DP	A	Editorial – PMPC Team to update.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.033	13 (whole chapter)	EA	06/23/22	The tunnel chapter was changed from chapter 12 to chapter 13. There are many references to chapter 12 sections which should be chapter 13 sections.	08/19/22	DP	A	Editorial – PMPC Team to update.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.034	13.2.8 third bullet	EA	06/23/22	"Retrieving data. Wait a few seconds and try to cut or copy again." Maybe this should be deleted.	08/19/22	DP	A	Editorial – PMPC Team to update.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.035	13.4.2, last paragraph	EA	06/23/22	"The final lining system of the tunnel must be designed with sufficient ductility and strength to withstand the ground deformations imposed on the tunnel by ground shaking and as required in Chapter 2, Owner's Requirements." Chapter 2 has no ground shaking requirements.	08/19/22	DP	A	Agreed. I believe the ODE/MDE used to be defined there. Text is actually repeated earlier in the tunnels section, will delete text in 13.4.2. All references will be to Section 10 - Seismic.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.001	Chapter 13, Scope (first sentence)	LZ	07/04/22	TBMs are no longer being considered for the project	08/19/22	DP	A	Agreed. TBM related criteria can be deleted, or retained if the same Criteria may ultimately be used for PAX.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.002	Section 13.1.1 (second para, second bullet)	LZ	07/04/22	From the tunnels submittal, it appears that there will not be precast tunnel lining in the tunnel	08/19/22	DP	A	Agreed, it's primarily used in conjunction with TBM driven tunnels. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.003	Section 13.1.5	LZ	07/04/22	Should add: however, a drainage system will be provided to collect and remove water infiltration resulting from waterproofing failure	08/19/22	DP	A	Agreed. Will expand section on drainage beneath Table 13-1 to state this per TA.012.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.004	Section 13.1.6	LZ	07/04/22	No precast tunnel segments . This whole section is for TBM	08/19/22	DP	A	Agreed. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.005	Section 13.2.7.2	LZ	07/04/22	The requirement that the design must not result in collapse may be in conflict with the requirement above that the lining have a 2-hr fire rating	08/19/22	DP	A	Agreed. Deleted the fire-rating.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.006	Section 13.4.2	LZ	07/04/22	Reference to bored tunnel	08/19/22	DP	A	Agreed. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.007	Section 13.4.2 (last para)	LZ	07/04/22	Reference to chapter 13 should be reference to Chapter 10	08/19/22	DP	A	Editorial – PMPC Team to update.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.008	Section 13.6, Bored Tunnel Lining Design	LZ	07/04/22	Section on TBM - not needed	08/19/22	DP	A	Agreed. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.009	Section 13.9.2, Bored Tunnels	LZ	07/04/22	Relates to TBM	08/19/22	DP	A	Agreed. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.010	Section 13.9.2, Bored Tunnels	LZ	07/04/22	Add "The design will also provide for drainage and removal of water infiltration for the life of the project	08/19/22	DP	A	Agreed. Will expand section on drainage beneath Table 13-1 to state this per TA.012. This applies to all tunnel types.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.011	Section 13.9.2, Bored Tunnels	LZ	07/04/22	TBM	08/19/22	DP	A	Agreed. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.012	Section 13.9.3, Drainage	LZ	07/04/22	Expand this section for the provision of a drainage system that will collect and remove water infiltration resulting from waterproofing failure	08/19/22	DP	A	Agreed, will add.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 131
Comments Closed 131
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 14, Architecture*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Randy Volenec (Design Team/PC Parch)	RV	John Bumanis (Design Team/Parsons)	JB
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AB (Caltrain)	AB	Bin Zhang (Caltrain)	BZ
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Matt Schreffler (PMPC/Mott MacDonald)	MJS	Osborne Anthony (PMPC SME/AECOM)	OA

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GEC.001	Ch. 14, General	RV	04/08/22	General note: Please confirm that all space descriptions align with the previously provided program spreadsheets Per Chapter 1 comment GEC.006 - Add Wayfinding signage to chapter 14 Architecture.	05/19/22	AK	A	Will confirm and update				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	14.1.3.1.e.	RV	04/08/22	Suggest eliminating "have canopies" from sentence as it is too restrictive.	05/19/22	OA	B	Canopies are used to protect stairs and escalators from the elements as a safety measure and to minimize maintenance. Removing them is not recommended.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	14.1.3.2.c - Design of concourse and lower concourse	RV	04/08/22	Suggest adding note "wherever possible without major modification to existing building structure or equipment."	05/19/22	OA	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	14.1.3.2.d - Design of concourse and lower concourse	RV	04/08/22	Suggest similar note as above (comment #3)	05/19/22	OA	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	14.1.3.2 - Public Restrooms, third bullet	RV	04/08/22	Replace "wall partition or wall hang partition" with "stall, door, and privacy latches"	05/20/22	OA	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	14.1.3.3 - Platform level features, first bullet	RV	04/08/22	Please indicate number of benches required per platform	05/26/22	OA	DE	Seating quantities and provisions requires an evaluation of ridership and the level of service anticipated as well as pedestrian flow analysis.	08/05/22	BCC	See new additional comment (#GEC.041) in latest CRL spreadsheet.	9/22/2022	MJS	Please see responses to new comments GEC.041, below	9/22/2022	CC
GEC.007	14.1.3.3 - Platform level features, seventh bullet	RV	04/08/22	Revise to read as "Unter-platform access, where feasible, understanding Caltrain platforms are 8" above top of rail"	05/19/22	AK	A	Will comply.	08/05/22	BCC	Caltrain has revised their platform height to 21.7" above top of rail at the transit center. So it might be better to revise to read as "under-platform access, where feasible."	9/27/2022	MJS	Revised as noted	9/27/2022	CC
GEC.008	14.3.1.2 - Platform Level	RV	04/08/22	Suggest less prescriptive dimensions for platforms as Caltrain and CHSRA guidelines and variances are evolving.	05/19/22	AK	B	The platform dimensions should reflect what is currently agreed upon with the operators.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	14.4.6 - Materials and Finishes, ¶3 First bullet	RV	04/08/22	Revise to read as " Metal panels should be designed to reduce the visual impact of scratches."	05/19/22	AK	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	14.4.6 - Materials and Finishes, ¶3 Second bullet	RV	04/08/22	Remove "be textured" from first sentence.	05/19/22	AK	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	14.4.6.6 - Reflectance, ¶1-2	RV	04/08/22	Suggest a less restrictive description "bright and light-colored" to allow flexibility in the design aesthetic.	05/19/22	OA	B	This description ensures visual quality that contributes to the passenger experience. It is not a major cost driver.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.012	14.6.1 - Stairs, ¶2	RV	04/08/22	Note: Train box floor-to-floor levels all exceed 20' and stairs are used throughout.	05/19/22	OA	DE	While criteria is defined for stairs, specific station configuration evaluation determines final stair layout. The Fourth and Townsend St. Station is also included in this criteria.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.013	14.6.1.2 - Width, ¶1-2	RV	04/08/22	Revise second sentence to read as follows: The minimum stair width is 5 feet, unless precluded by existing building structure."	05/19/22	OA	DE	Suggested width reduction needs to be checked and confirmed with overall egress requirements.	08/05/22	BCC	Since some stairs at the Transit Center are provided with bike channels to ease access down and up from Platform level, it will be difficult to meet the minimum stair width of 5ft requirement without impacting the existing building structure.	9/22/2022	OA	Revised as follows: "Stair widths must be based on anticipated levels of service. The minimum stair width is 5 feet, unless precluded by existing building structure. If 5 feet stair width cannot be achieved, any variance must be approved by TJPA." The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/11/22	CC
GEC.014	14.6.1.3 - Headroom, ¶1-1	RV	04/08/22	Revise sentence to read as follows: "… must be maintained, unless precluded by existing building structure at which point code required minimum clear headroom will be utilized."	05/19/22	OA	A	Will comply.	08/05/22	BCC	This recommended language was not included in the new draft. At the Transit Center, the as-built condition might preclude the ability to provide a minimum 9ft clear in certain locations.	9/22/2022	OA	Revised as follows: "A minimum clear headroom of 9 feet, measured perpendicular from the line of the tread nosing to the underside of the ceiling, must be maintained, unless precluded by existing building structure. If 9 feet clear headroom cannot be achieved, any variance must be approved by TJPA." The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/11/22	CC
GEC.015	14.6.1.5 - Guardrails and Handrails, ¶1-2	RV	04/08/22	Revise second sentence to read as follows: "If glass is used, it must be laminated and tempered, to meet RVA blast requirements."	05/19/22	OA	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.016	14.6.3 - Escalators, ¶1-1	RV	04/08/22	Revise first sentence to read as follows: ".. Exceeds 12 feet, except where stairs are required, in lieu of escalators, to meet projected passenger loads."	05/19/22	OA	A	Will comply.	08/05/22	BCC	This recommended language was not included in the new draft. At the Transit Center, probably mode of vertical circulation are stairs due to the projected passenger loads and as-built conditions.	9/22/2022	OA	Revise per original comment	9/27/2022	CC
GEC.017	14.6.3.1 - Space Requirements (Queuing and Run-off Space), ¶1	RV	04/08/22	Note: In Phase 1, the provided queuing and run-off spaces were 16', which were determined to be adequate for the passenger loading.	05/19/22	OA	DE	Suggested queuing needs to be checked and confirmed with overall level of service requirements.				05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC
GEC.018	14.6.3.2 - Design Features, ¶1-1	RV	04/08/22	Revise first sentence to read as follows: "Escalators must be heavy-duty, commercial grade with the following design features:"	05/19/22	OA	C	A reference has been added to the APTA Heavy Duty guidelines. Escalator equipment should reflect a level of performance commensurate with utilization appropriate for a transit system.	08/05/22	BCC	Per TJPA direction, heavy-duty commercial grade escalators were provided in Phase 1 of the Transit Center and the same type was requested for Phase 2. The criteria still reads "transit-grade".	9/22/2022	OA	Revise per original comment (carry forwrad Phase 1 standard)	9/27/2022	CC
GEC.019	14.6.3.2 - Design Features	RV	04/08/22	Note: HD commercial grade were used in Phase 1 due to initial costs and maintenance costs with little perceived benefit by using transit-grade equipment.	05/19/22	OA	DE	The suggested reduction selection requires evaluation and confirmation that long term performance and maintenance benefits are not minimized with use of commercial equipment. A variance may be requested by the design team, if needed.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

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GEC.020	14.6.3.6 - Location (Safety), ¶1-1	RV	04/08/22	TJPA operational issue at East Beale Pavilion.	05/20/22	OA	A	Under Safety heading, a sentence will be added that notes the below are "where feasible."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.021	14.6.3.7 - Design Features, ¶1-1	RV	04/08/22	Note: Similar to escalators, I believe we used HD commercial elevators in Phase 1. I need to confirm this and a few other items with our VT consultant, but will follow up on Escalators and Elevators as soon as I have information.	05/20/22	OA	DE	The suggested reduction selection requires evaluation and confirmation that long term performance and maintenance benefits are not minimized with use of commercial equipment. A variance may be requested by the design team, if needed.	08/05/22	BCC	It is confirmed that HD commercial grade elevators were installed in Phase 1 per TJPA direction. HD commercial grade elevators were directed by TJPA to be specified for Phase 2 scope as well.	9/22/2022	OA	Section 14.6.4.3 "Design Features" has been updated to state the following: "Elevators must be heavy-duty transitcommercial-grade as follows: "	10/10/22	CC
GEC.022	14.6.3.7 - Design Features (Freight Elevators), Third bullet	RV	04/08/22	Note: Loading Dock Phase 1 Freight elevator is 10,000# capacity, second shaft is constructed for second 10,000 LD elevator	05/20/22	OA	A	Will update criteria accordingly.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.023	Chapter 20	AB	09/12/16	LEGACY Comment GEC16.087 - Per the terms of NTP#9, the conceptual design of BART/MUNI pedestrian connector is now considered part of the scope of the DTX project. This Chapter does not comprise any design criteria for the BART/MUNI Pedestrian Connector component.	02/28/22	AK	C	As of September 2021, the BART/Muni Pedestrian Connector has been officially deferred from the DTX project.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.024	Section 20.1	RCCo	09/12/16	LEGACY Comment GEC16.088 - Request confirmation extent of 'integration' between the existing 4th & Townsend Surface Station with the new UG Station to avoid unnecessary redundancy – update accordingly.	02/28/22	MM	C	For this revision of the design criteria, no further information is available from Caltrain and/or Prologis regarding integration. The design criteria is a living document and will be updated accordingly as plans for the Fourth and King Railyard mature.	05/04/22	ROK					05/04/22	CC
GEC.025	Section 20.1.1	RCCo	09/12/16	LEGACY Comment GEC16.089 - Request confirmation of Station Planning requirements for the new 4th & Townsend UG Station - update accordingly.	02/28/22	MM	C	Programmatic space planning requirements have been provided by Caltrain and CHSRA. It is not the intention of PMPC to include the full extent of the operator requirements in the design criteria.	05/04/22	ROK					05/04/22	CC
GEC.026	Section 20.1.1.3	RCCo	09/12/16	LEGACY Comment GEC16.090 - Accessible path from the existing 4th & Townsend Surface Station to the new UG Station will be maintain but there is NO direct connection to and from existing transit facilities to the platform level.	02/28/22	AG	A	Removed last bullet point: "Direct connections to and from existing transit facilities shall be accessible to the platform levels."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.027	Section 20.1.2.1	RCCo	09/12/16	LEGACY Comment GEC16.091 - Proposed 4th & Townsend UG Station length is only 700'. Design Criteria Platform length listed 800' long.	02/28/22	MJS	A	The minimum platform length has been updated to 875' per Caltrain direction (assumes 10-car EMU trainsets).	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.028	Section 20.1.2.1	RCCo	09/12/16	LEGACY Comment GEC16.092 - Request confirmation from Caltrain 1'-11" top of rail to top of platform – update accordingly (per response).	02/28/22	MM	A	Caltrain requirement = 23" per Caltrain letter 4/27/17 CHSRA requirement = 51"	05/04/22	ROK	Caltrain Platform height has been subsequently changed to 21.7" above TOR.				05/04/22	CC
GEC.029	Section 21.1	RCCo	09/12/16	LEGACY Comment GEC16.093 - Under stair emergency egress purpose only shall comply – besides NFPA 130 add CBC 433 (for fixed transit rail station)	02/28/22	AK	A	Revised text to read: "…NFPA 130 and CBC 443 (Fixed Guideway Transit and Passenger Rail Systems).	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.030	Section 21.3	RCCo	09/12/16	LEGACY Comment GEC16.094 - Add dedicated escalator controller room(s) are required to house escalator controller and disconnect equipment – such room(s) shall have compliant cooling / venting requirements (as applicable)	02/28/22	OA	A	Most requirements such as for loading, controls and key aspects for operation are noted under A.17.1. Listing all such requirements in criteria can be an issue especially if some are omitted or inadvertently and incorrectly transcribed. Ventilation, fire protection and structural requirements are all covered in other parts of the criteria. Suggest that referencing ASME A17.1 for escalator and elevators compliance is sufficient. Will add reference to ASME A17.1 in this section.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.031	Section 21.4	RCCo	09/12/16	LEGACY Comment GEC16.095 - Add elevator machine room(s) are required to house elevator equipment (per type of elevators) – such room(s) shall have compliant cooling / venting requirements (as applicable).	02/28/22	OA	A	Criteria should reference ASME A17.1 for elevator requirements for the same reasons noted in response to comment GEC16.094. Will add reference to ASME A17.1 in this section.	05/04/22	ROK	Caltrain Platform width has been subsequently changed to 33'-10".				05/04/22	CC
GEC.032	Section 21.4.4	RCCo	09/12/16	LEGACY Comment GEC16.096 - Confirm with Caltrain if there is a preference for type of elevator design to be incorporated, such as hydraulic, machine-room less (MRL)	02/28/22	AK	C	It is understood that the type of elevator will affect the design and requirements of the machine/control rooms for the elevators. Added text that says, "machine rooms will be provisioned with appropriate equipment related to the type of elevator that is chosen for the Fourth and Townsend Station."	05/04/22	ROK					05/04/22	CC
GEC.033	20.1	DF	10/01/18	LEGACY Comment GEC18.100 - Request confirmation extent of 'integration' between the existing 4th & Townsend Surface Station with the new Fourth & Townsend Station to avoid unnecessary redundancy – update accordingly	02/28/22	MM	C	For this revision of the design criteria, no further information is available from Caltrain and/or Prologis regarding integration. The design criteria is a living document and will be updated accordingly as plans for the Fourth and King Railyard mature.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.034	20.1.1.3	DF	10/01/18	LEGACY Comment GEC18.101 - Accessible path from the existing surface station to the new Fourth & Townsend Station will be maintain but there is NO direct connection to and from existing transit facilities to the platform level. Request clarification intent of 'direct connection'.	02/28/22	AG	A	See 2016 comment #90; Removed last bullet point: "Direct connections to and from existing transit facilities shall be accessible to the platform levels."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.035	20.1.2.1 Platforms	DF	10/01/18	LEGACY Comment GEC18.102 - Update platform lengths, widths and top of rail to top of platform height requirements	02/28/22	AK	A	Updated platform widths based off Matt's note in section 20.1.2.1. Split platform design requirements into two sections: one for Caltrain and one for CHSRA.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.036	20.3	DF	10/01/18	LEGACY Comment GEC18.103 - It's the understanding modification of the existing surface station is NOT part of DTX Work Scope	02/28/22	AK	A	Removed verbiage that said the DTX scope covered designing the modifications to the Fourth and King Street surface station and railyard. Caltrain will be performing this work instead.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.037	21.3.9.1	DF	10/01/18	LEGACY Comment GEC18.104 - Each escalator includes a controller cabinet & disconnect panel that will need to be 'housed' nearby – preferably in an Escalator Equip Room. Such room(s) shall have code compliant cooling / venting requirements	02/28/22	OA	A	Agree. Controller cabinets and panels should be within reasonable proximity of the escalator equipment for clear visibility during maintenance and testing procedures. Will add reference to ASME A17.1 in this section.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.038	Chapter 21, page 21-1 of 9	JB	10/01/18	LEGACY Comment GEC18.105 - Suggest that the Codes and Standards also include a reference to APTA Guidelines covering Heavy Duty Transit Escalators	02/28/22	AG	A	Added.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.039	Paragraph 21.3.8	JB	10/01/18	LEGACY Comment GEC18.106 - In addition to just stopping escalators in the event of a fire,2017 NFPA 130 paragraph 5.3.5.7 contains additional requirements that should be included in the criteria.	02/28/22	AK	A	Added language from NFPA 130, paragraph 5.3.5.7: "b. Escalators shall be constructed of noncombustible materials." "c. "...remotely as part of a pre-planned evacuation response; escalators shall be capable of being stopped locally by a manual stopping device at the escalator."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.040	Section 21.4	DF	10/01/18	LEGACY Comment GEC18.107 - Confirm with Caltrain if there is a preference for type of elevator design to be incorporated, such as hydraulic, machine-room less (MRL)	02/28/22	MM	C	Duplicate comment with GEC16.096. See that comment.	05/04/22	ROK					05/04/22	CC
GEC.041	Section 14.1.3.3, Platforms (Passenger Benches)	HK	08/03/22	The criteria notes that "Passenger benches" at the platform level must be included. However, there is no mention of benches at the Lower Concourse where it will provide waiting/seating areas for rail passengers at Salesforce Transit Center. Also, benches at the platform level should be confirmed with the operator since CHSRA was previously planning to keep passengers on the lower concourse before calling passengers to board and head down to the platform level. In addition, the platform widths and obstructions limit clearances at platform level, therefore, placement of benches will be restrictive.	09/22/22	OA	DE	Comment requires clarification - TJPA will need to define % of projected ridership (Currently unavailable or inaccurate - same for lower concourse)				10/07/22	MJS	The responder (PMPC Team) added a new bullet "passenger benches" to section 14.1.3.3 concourse and lower concourse comment; therefore this comment is considered closed. The responder (PMPC Team) recognizes that the quantity and location of benches will need to be defined once updated ridership numbers are provided by the operators during the next phase of design.	10/10/22	CC
GEC.042	Section 14.1.3.3, Platforms (Vertical Clearance)	HK	08/03/22	Due to existing conditions at transit center, large ventilation ducts running over the platforms and CHSRA platfrom height, vertical clearances from floor to ceiling of 12 feet cannot be met at the Salesforce Transit Center.	09/22/22	OA	DE	Revised as follows: •Vertical clearances between the floor and ceiling are not less than 12 feet in the general platform areas, unless precluded by existing building structure. If 12 feet vertical clearance cannot be achieved, any variance must be approved by TJPA.. •In limited areas, such as under partial mezzanines and at the platform ends next to the emergency stair and service area, vertical clearances may be reduced to 10 feet. "				10/11/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/11/22	CC
GEC.043	Section 14.2.1.3	RCCo	08/03/22	(CHSRA section, first bullet) Minimum side platform width for CHSRA for Fourth and Townsend Street Station is listed as 17'-10". That section of the architectural criteria is new and was not listed when we last reviewed the criteria in April. That dimension should also be 17'-0" so that the Fourth and Townsend Street Station design is compliant.	09/22/22	OA	A	Update criteria to reflect minimum platform width. Designer to confirm no adverse impact to level of service and egress				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/10/22	CC
GEC.044	Section 14.3.1.2, Plaform Level (Caltrain)	HK	08/03/22	The min. horizontal clearance of 25 feet for permanent structures and 16ft for minor structure would require a variance. Per latest variance request draft, it notes that Caltrain changed the minor structure clearance to 17ft. Should any of this information be reflected in this DTX criteria?	09/22/22	OA	A	Agree to modify to 17'-0" minimum horizontal clearance to structure from centerline of track				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/10/22	CC
GEC.045	Section 14.3.2.1, Lower Concourse Level AND Section 14.3.2.2, Platform Level	HK	08/03/22	The program spaces listed should align with the latest program used to generate the preliminary engineering drawings based on feedback from TJPA and the rail operators.	09/14/22	MM	A	Agree. The text will be updated to reflect the current programmatic spaces spreadsheet.				10/17/22	KS	Aligned requirements in sections 14.3.2.1 and 14.3.2.2 with the information from programmatic space spreadsheet "Draft Calculation of CHSRA space rqmts -per Final 30% Design Tech Memo"	11/10/22	cc
GEC.046	Section 14.6.4.3, Design Features (Elevators)	HK	08/03/22	At the transit center and for phase 2, there will be passenger and service elevators. Each platform will have a dedicated service elevator. Should there be some mention of this in the design criteria? For additional information, refer to preliminary engineering architectural tech memo-Appendix B.2 submission.	09/22/22	OA	A	A service elevator will be required (or one of passenger elevators must have that capability) between platform level and street level. Added the following sentence to section 16.6.4.2: "Each platform at Salesforce Transit Center and Fourth and Townsend Street Station must have one dedicated service elevator."				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/10/22	CC
GEC.047	Section 14.6.4.3, Design Features (Freight Elevators)	HK	08/04/22	Are 10,000lbs "interior" freight elevators being used at Fourth and Townsend Station or at Tunnel Vent Buildings? Salesforce Transit Center only has the 10,000lbs "loading dock" SERVICE elevators, not "FREIGHT". Also, rated speed of the 10,000lb service elevator at the transit center is 200fpm., not 350fpm. For additional information, refer to preliminary engineering architectural tech memo-Appendix B.2 submission.	09/22/22	OA	A	Criteria updated to be consistent with the Phase 1 elevator requirements.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/10/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 131
Comments Closed 131
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 14, Architecture*		
Document date:	*2/28/2022*		

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AB (Caltrain)	AB	Bin Zhang (Caltrain)	BZ
James Deane (CHSRA)	JRD	Paul Hebditch (CHSRA/HNTB)	PH
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Matt Schreffler (PMPC/Mott MacDonald)	MJS	Osborne Anthony (PMPC SME/AECOM)	OA

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Cal.001	Chapter 14	BZ	04/21/22	reconcile chapter number with section 1.6 Design Criteria Organization; renumber chapter subsection accordingly	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Chapter 14 - 14.1.3	BZ	04/21/22	coordinate subsection numbering	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.003	Chapter 14 - 14.1.3	BZ	04/21/22	reference **Environment and Shared Design Characteristics** subsection for station design criteria	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.004	Chapter 14 - 14.1.3.3	BZ	04/21/22	platform elevation requirements for Caltrain and CHSR rail cars; restart list at a.	05/13/22	MM	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.005	Chapter 14 - 14.1.3.4	BZ	04/21/22	include subsection for **Vertical Circulation**; reference corresponding subsection number for design criteria	05/13/22	AK	C	Section is provided as Section 14.6							05/16/22	CC
Cal.006	Chapter 14 - 14.2.1	BZ	04/21/22	coordinate subsection numbering	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.007	Chapter 14 - 14.2.1.3	BZ	04/21/22	specify station is to be designed with outboard platform arrangement	05/19/22	MM	A	Text has been revised to provide platform widths for both side platforms and center platforms.	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
Cal.008	Chapter 14 - 14.2.1.3	BZ	04/21/22	18 feet per Caltrain Standard. Add "Submit a Design Variance to Caltrain for Approval for nonstandard design." at the end of the paragraph.	05/19/22	MM	A	Text has been added to paragraph.	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
Cal.009	Chapter 14 - 14.2.1.4	BZ	04/21/22	revise to "5 feet 8 inches" Per the email confirmation from Caltrain	05/19/22	MM	A	Text has been revised to 5'8".	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
Cal.010	Chapter 14 - 14.2.1.3	BZ	04/21/22	restart list at a.	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.011	Chapter 14 - 14.2.1.3	BZ	04/21/22	coordinate subsection numbering	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.012	Chapter 14 - 14.2.2	BZ	04/21/22	omit 'assumed'	05/13/22	AK	A	Text has been revised.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.013	Chapter 14 - 14.2.2.1	BZ	04/21/22	coordinate chapter number(s)	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.014	Chapter 14 - 14.2.2.2	BZ	04/21/22	include separate CHSRA platform level criteria similar to the Transit Center	05/25/22	MM	A	Text has been revised.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.015	Chapter 14 - 14.3.1.2	BZ	04/21/22	specify station is to be designed with center platform arrangement	05/23/22	MM	B	This is not a requirement, but is the current design scheme. It is memorialized in the 30% design documents and the Phasing Study.				05/23/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/23/22	CC
Cal.016	Chapter 14 - 14.3.1.2	BZ	04/21/22	revise list to g.	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.017	Chapter 14 - 14.5	BZ	04/21/22	omit 'generally'; revise reference section to **Fire - Life Safety**; coordinate subsection reference	05/25/22	OA	A	Text has been revised. Reference section added.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.018	Chapter 14 - 14.5	BZ	04/21/22	coordinate chapter numbering	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.019	Chapter 14 - 14.6.2	BZ	04/21/22	restart list at a.	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.020	Chapter 14 - 14.6.3.2	BZ	04/21/22	reference **Seismic Design** chapter for seismic design parameters	05/25/22	OA	A	Reference section added.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.021	Chapter 14 - 14.7	BZ	04/21/22	begin new subsection for **Elevators**; revise subsequent subsection numbering	05/13/22	MM	DE	To be evaluated by PMPC Team during technical edit	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.022	Chapter 14 - 14.7	BZ	04/21/22	revise bullet for list value e.	05/13/22	AK	A	(Section is now 14.6.3.6) To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.023	Chapter 14 - 14.7	BZ	04/21/22	include Seismic Design heading; reference **Seismic Design** chapter for seismic design parameters	05/25/22	OA	A	Reference section will be added.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.024	Section 20.1	BZ	10/18/18	LEGACY Comment Cal18.042 - Section 20.1 Fourth and Townsend Street Station (first paragraph, highlighted text - "The Fourth and Townsend underground station shall be designed and configured for the exclusive use of Caltrain." [ZB] Verify whether HSR will make a stop here. [DK] Yes, please update as it is my understanding CHSRA is planning to have trains stopping here.	05/04/22	MJS	A	California High-Speed Rail will stop at Fourth and Townsend Street Station 4x per peak hour per direction based on latest 2020 Business Plan.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.025	Section 20.1.2.1	BZ	10/18/18	LEGACY Comment Cal18.043 - Section 20.1.2.1 Public Areas, under "Platforms" (bullet "a", highlighted text - "The minimum platform width shall be 16 feet.") Verify whether only an outboard platform will be adopted at Fourth and Townsend Street Station.	05/04/22	MJS	C	The Executive Steering Committee voted to adopt Concept C (and associated sub-concepts B' and B'-Reduced) in September 2021 - concept features center island and outboard platforms at Fourth and Townsend Street Station.							05/16/22	CC
Cal.026	Section 20.1.2.1	BZ	10/18/18	LEGACY Comment Cal18.044 - Section 20.1.2.1 Public Areas, under "Platforms" (bullet "b", highlighted text - "..800 feet.") [ZB] 875 feet is a minimum platform length of 10-car consist. [DK] Per JPB's letter, platform length should be 875 feet.	05/04/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 3-10]: "Platform length: The standard platform length shall be 875 feet to accommodate a 10-car EMU consist. See Figure 3-5.." Caltrain minimum platform length will be updated throughout the design criteria to 875 feet (10-car consist).	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC

Transbay Program
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Comments Closed	**131**
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Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
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Cal.027	Section 20.1.2.1	BZ	10/18/18	LEGACY Comment Cal18.045 - Section 20.1.2.1 Public Areas, under "Platforms" (bullet "b", highlighted text - "750 feet.") 850 feet should be maintained for a minimum platform length.	05/04/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 3-10]: "Platform length: The standard platform length shall be 875 feet to accommodate a 10-car EMU consist. See Figure 3-5.." Caltrain minimum platform length will be updated throughout the design criteria to 875 feet (10-car consist).	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.028	Section 20.1.2.1	BZ	10/18/18	LEGACY Comment Cal18.046 - Section 20.1.2.1 Public Areas, under "Platforms" (bullet "e", highlighted text - ".. 1 foot 11 inches..") [ZB] Verify the lower floor height for Caltrain EMU to meet the level boarding requirement. [DK] Floor height of the EMU is 21.85" above top of rail	05/04/22	MM	A	Updated text accordingly.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.029	Section 20.2 Table 20.4	BZ	10/18/18	LEGACY Comment Cal18.047 - Table 20.4, Transit Center Platform Dimensions (Caltrain's minimum platform length "800 ft") Update to "875 ft"	05/04/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 3-10]: "Platform length: The standard platform length shall be 875 feet to accommodate a 10-car EMU consist. See Figure 3-5.." Caltrain minimum platform length will be updated throughout the design criteria to 875 feet (10-car consist).	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.030	Section 20.2 Table 20.4	BZ	10/18/18	LEGACY Comment Cal18.048 - Table 20.4, Transit Center Platform Dimensions (Caltrain's minimum platform width "26 ft min.") Update to "28 ft min."	05/04/22	MJS	A	Will comply	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.031	Section 20.2 Table 20.4	BZ	10/18/18	LEGACY Comment Cal18.049 - Table 20.4, Transit Center Platform Dimensions (Caltrain's Platform height (above top of rail) - "1 ft 11 in.") [ZB] Verify the lower floor height for Caltrain EMU to meet the level boarding requirement. [DK] Floor height of the EMU is 21.85" above top of rail	05/04/22	MM	A	Updated text accordingly.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC

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HSR.001	14 - General	JRD	04/15/22	General comment- do not use should, would, could, may, or consider, those words do not require compliance and so are not requirements	05/18/22	MM	DE	PMPC to ensure consistent use of approved words for document.							05/18/22	CC
HSR.002	14 - General	JRD	04/15/22	General comments- I do not see references to APTA standards except for general statement in references for elevators and escalators- they should be considered	05/25/22	OA	A	APTA reference has been added.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.003	14 - General	JRD	04/15/22	Materials- consider how to address damage to materials and impacts to operations- e.g. a broken glass handrail would make stair unusable until the panel is replaced with a code compliant temporary material or new permanent material- these kinds of incidents can significantly impact operations if they limit passenger access to the system	05/25/22	OA	C	Section 14.4.6 includes material performance criteria. Concerns for downtime due to damages can be mitigated with allowances for spares.							05/26/22	CC
HSR.004	14 - General	JRD	04/15/22	Consider how will future escalator and elevator replacement be accomplished in the future?	05/25/22	OA	DE	Finishes will require careful placement and consideration and can be demountable to allow convenient access to conveyance equipment for maintenance and/or replacement.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.005	14.1.2	JRD	04/15/22	Include FRA accessibility requirements. Consider language to address conflicts between, CBC, ADAAG, FRA, and other local accessibility requirements	05/25/22	OA	A	Reference text will be added.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.006	14.1.3.1	JRD	04/15/22	How will you manage homeless sleeping in doorways	05/23/22	MM	C	The TJPA has a security policy to address this concern.							05/23/22	CC
HSR.007	14.1.3.1	JRD	04/15/22	100 year sea level rise should be based on RCP 8.5 climate criteria	05/13/22	AK	C	PMPC issued a memo regarding the estimate of the critical inundation elevation that the DTX station entrances and tunnel portal must be constructed at so that the stations will not be inundated in case of a 100-year flood. The elevation was determined by using the RCP 8.5 criteria.							05/16/22	CC
HSR.008	14.1.3.2	JRD	04/15/22	Will TVM and Fare Control for HSR be by HSR Train Operator (TO) or will DTX provide- suggest it should be by HSR TO and that there be dedicated Information Communications Technologies (ICT) pathways to dedicated server racks- they can be in dedicated room or in shared room in cages	05/26/22	MM	C	CHSRA has not selected a train operator at this time. The DCM will be updated when CHSRA has selected a rolling stock and this information can be included at that time if a train operator has also been selected.							05/26/22	CC
HSR.009	14.3.2	JRD	04/15/22	HSR ticket window is an information booth only with no sales but must be adjacent to HSR TVM so staff can support customers with ticketing problems	05/23/22	MM	C	It is the intent to locate TVM along the length of the stations to provide convenient access for patrons. The information booth can be located near one set of TVMs.				05/23/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/23/22	CC
HSR.010	14.1.3.3	JRD	04/15/22	Platforms require blue light phones for emergency communications	05/23/22	MM	A	Will be added to list of requirements.				05/23/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/23/22	CC
HSR.011	14.2.1.1	JRD	04/15/22	List missing HSR signage	05/23/22	MM	A	Will add "HSR signage, where applicable"				05/23/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/23/22	CC
HSR.012	14.3.2.2	JRD	04/15/22	Can HSR maintenance equipment spaces be removable? Because the final operator and service plan is not in place the space needs may change and, if spaces are removable if not needed that will improve platform mobility	05/23/22	MM	C	The station fit out design can consider this as an option for future flexibility. Do not recommend changes to the design criteria at this time. It is anticipated that the design criteria will be updated when CHSRA rolling stock is known. This can be reviewed again at that time.							05/23/22	CC
HSR.013	14.4.2	JRD	04/15/22	As both stations are underground how will natural light be maximized?	05/23/22	AK	C	One of the main features of the Transit Center is the light column, which brings light through lower levels. The Fourth and Townsend St. Station is beneath the roadway reducing opportunities for natural light.							05/26/22	CC
HSR.014	14.4.2	JRD	04/15/22	Provide a reference standard for best practice such IALD or ATPA	05/26/22	OA	B	Electrical references should remain with Chapter 17.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.015	14.4.5	JRD	04/15/22	Suggest additional dedicated braille on handrails	05/26/22	OA	DE	Location of braille will be evaluated and allocated as per ADA standards.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.016	14.4.5	JRD	04/15/22	Signage colorway should consider elderly low visual comprehension fonts and colorways	05/23/22	AK	C	Colorway and design will follow MTC Hub Signage standards.							05/23/22	CC
HSR.017	14.4.6.2	JRD	04/15/22	Do not limit vandalism cleaning to only 9' - this should apply to all exposed surfaces	05/26/22	OA	B	Vandalism is typically experienced on surfaces within direct reach of the public. Above 9' may be impractical and even costly. This requires evaluation and can be updated in the next revision of the DCM, if necessary.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.018	14.4.6.5	JRD	04/15/22	Provide design criteria and consider prohibiting the use of thinset systems	05/26/22	OA	DE	This is typically provided in specifications. This requires evaluation.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.019	14.4.6.6	JRD	04/15/22	Conflicts with need to provide glare free surfaces as glare impact users with visual impairments. High reflectivity surfaces require more maintenance to maintain the desired lighting, Require LED lighting to reduce energy requirements	05/26/22	OA	A	Text revised to better articule material reflectivity without minimizing safety.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.020	14.4.6.7	JRD	04/15/22	Consider easily replaceable materials in high contact areas.	05/26/22	OA	A	Will comply	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.021	14.4.6.8	JRD	04/15/22	Provide allowable acoustical performance for each space type or point to a reference standard to meet	05/26/22	OA	DE	Acoustical performance will vary by location and objective. This requires evaluation to identify what is appropriate maintain speech intelligibility in public areas, both at platform and at concourses.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.022	14.6.1.2	JRD	04/15/22	Suggest requiring queuing analysis to determine runoff and queuing requirements	05/26/22	OA	DE	Agree. This is based on ridership and requires evaluation including a pedestrian flow analysis.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.023	14.6.1.1	JRD	04/15/22	LOS needs to consider two way movement- consider one way stair flows to improve passenger movement.	05/26/22	OA	DE	Passenger movement evaluation depends on ridership and overall station configuration. While single directional VCEs may improve passenger flow in some cases, a full evaluation is required.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.024	14.6	JRD	04/15/22	As a general rule I avoid stating code requirements as they can change between planning and construction. Compliance with CBC is mandatory so restating its requirements is redundant.	05/26/22	OA	A	Text will be revised to not restate codes.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.025	14.6	JRD	04/15/22	Can escalators slow to stop and reverse to egress direction while fully loaded? This will help with egress capacity requirements	05/26/22	OA	B	As an operational practice this is not done for safety reasons. The system will be sized both for peak operations as well as emergency conditions.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.026	14.6.3.7	JRD	04/15/22	Size elevators to ensure the can move the train headway disabled population based on average % of disabled population.	05/26/22	OA	DE	Agree. This is based on ridership and requires evaluation. This can be included in the next revision of the DCM as ridership is better understood.				05/26/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.027	Section 20.1, 20-1	PH	10/01/18	LEGACY Comment HSR18.017 - CHSR will also operate at 4th and Townsend therefore design and configuration should also meet their requirements	05/04/22	AG	A	Revised text to read: "…configured for the use of Caltrain and California High Speed Rail Authority (CHSRA)." "CHSRA Design Criteria" and "CHSRA Environmental and Engineering Technical Memoranda" added to Codes and References	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.028	Section 20.1.2.1, 20-3 (Station Entrances)	PH	10/01/18	LEGACY Comment HSR18.018 - Fourth and Townsend should also be identifiable as a CHSR station	05/04/22	AG	A	Revised to read as follows: "..and recognizable as a part of the blended Caltrain and CHSRA system."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.029	Section 20.1.2.1, 20-5 (Platforms)	PH	10/01/18	LEGACY Comment HSR18.019 - Section needs revision to accommodate CHSR operation at Fourth and Townsend	05/04/22	MM	A	Revised.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**131**
Comments Closed	**131**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 14, Architecture*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Randy Volenec (Design Team/PC Parch)	RV	John Bumanis (Design Team/Parsons)	JB
Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo	David Fun (Design Team/Robin Chiang & Co.)	DF
AB (Caltrain)	AB	Bin Zhang (Caltrain)	BZ
James Deane (CHSRA)	JRD	Paul Hebditch (CHSRA/HNTB)	PH
M. Brunner (CHSRA)	MBr	X. Banko (CHSRA)	XB
Luis Zurinaga (SF CTA)	LZ	Heather Kim (Design Team/PCPA)	HK
Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Osborne Anthony (PMPC SME/AECOM)	OA

AC – Action Code
A – Responder agrees and will comply
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ROK – response okay
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.030	Section 20.3, 20-12	PH	10/01/18	LEGACY Comment HSR18.020 - Section needs revision to accommodate CHSR operation at Fourth and Townsend	05/04/22	MM	A	Revised.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.031	Section 20.1.2.1, 20-6	MBr	10/01/18	LEGACY Comment HSR18.049 - 20.1.2.1 All 51" platforms the area below the "safe area" shall be sized to allow O&M staff members access to inspected the EMU's / Trainset's running gear while they are stationary next to the platform. Reference HSR TM 2.2.4, Section 3.3.10.	05/04/22	AG	A	Added bullet "i." to platform geometric requirements: "A clear refuge space shall be provided under the platform edge at the track level. Refuge areas shall be a minimum of 30 inches high and 30 inches deep along the entire length of the platform. Exits from this space shall be provided at platform ends. If platform gates or doors are provided, these areas are not required."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.032	Section 2.1.2.2, 20-7	MBr	10/01/18	LEGACY Comment HSR18.050 - 20.1.2.2 Owner and Operator Areas - similar facilities shall be provided for CHSRA O & M personnel	05/04/22	AG	A	Included CHSRA.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.033	Table 20.1, 20-8	MBr	10/01/18	LEGACY Comment HSR18.051 - Table 20.1 Train & locomotive noise passing/entering/leaving shall meet or be less than specified in CFR49 Part 210 App. A per the FRA's measuring criteria	05/04/22	OA	A	Within stations, noise levels must comply with Appendix A to Part 210 - Summary of Noise Standards, 40 CFR Part 201. Noise levels whether trains are stationary or moving shall consider track type (ballast, ties, concrete, etc.). Preferred: 65 - 85 dBA max. This will be added to the chapter.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.034	Section 20.1.5.3, 20-9	MBr	10/01/18	LEGACY Comment HSR18.052 - 20.1.5.3 Resistance to Vandalism - the platform area will have intrusion protection and close circuit video surveilles 24/7 to protect trainsets and EMUs from vandalism and graffiti	05/04/22	AG	A	Added last paragraph: "Platform areas will have intrusion protection and closed circuit video surveillance 24 hours a day, seven days a week to protect trainsets and EMUs from vandalism and graffiti."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.035	Table 20.4, 20-12	XB	10/01/18	LEGACY Comment HSR18.053 - Table 20.4 - Platform height (above top of rail) = 51" (CHSRA)	05/04/22	MJS	A	Platform height above TOR updated accordingly.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.036	Table 20.4, 20-12	MBr	10/01/18	LEGACY Comment HSR18.054 - Bottom of Table 20.4 the safety zone shall be high enough to allow for inspection personnel to visually inspect the trainset's running gear and couple and uncouple cars. Reference HSR TM 2.2.4, Section 3.3.10.	05/04/22	AG	C	TM 2.2.4 Section 3.3.10 states 30"x30" minimum. DC follows this requirement.							05/18/22	CC
HSR.037	Section 20.3, 20-12	XB	10/01/18	LEGACY Comment HSR18.055 - 20.3 - Confirm that the Fourth and King Street station is for the exclusive use of Caltrain.	05/04/22	MM	A	Updated to reflect that modifications to the Fourth and King St. Station will be performed by Caltrain.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.038	Chapter 20 (General)	JRD	10/01/18	LEGACY Comment HSR18.077 - Reference CHSRA design requirements and coordinate relevant standards	05/04/22	AG	A	Added throughout Chapter.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.039	Chapter 20 (Codes and Standards)	JRD	10/01/18	LEGACY Comment HSR18.078 - Why are NFPA 101 and 220 included? - they are not state recognized codes	05/04/22	OA	C	NFPA 130 standard applies to transit rail and often non-public areas on transit facilities governed by other codes including state codes through 101 invoke NFPA 130. For this reason these are included. All other state codes are applicable and will not be replaced by 101 or 220.							05/18/22	CC
HSR.040	Chapter 20 (General)	JRD	10/01/18	LEGACY Comment HSR18.080 - CHSRA design criteria need to be incorporated	05/04/22	AG	A	Added throughout Chapter.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.041	Section 20.1.4.5.f, 20-9	JRD	10/01/18	LEGACY Comment HSR18.081 - change "or" to "and"	05/04/22	AG	A	Revised.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.042	Section 20.2, 20-12	JRD	10/01/18	LEGACY Comment HSR18.082 - Add CHSRA 4th & Townsend and 4th & King criteria	05/04/22	MM	C	Included in previous section for Fourth and Townsend St. Station.							05/18/22	CC
HSR.043	Section 21.4.3, 21-6	JRD	10/01/18	LEGACY Comment HSR18.083 - Elevator quantity and size shall be capable of moving an representative average ambulatory disabled population within peak train headway period	05/04/22	AK	C	The minimum number of elevators are provided in Section 21.4. The minimum size of each elevator will be determined based on the load capacity or the minimum size to fit at least one horizontally positioned stretcher or gurney.							05/18/22	CC
HSR.044	Section 21.4.7, 21-9	JRD	10/01/18	LEGACY Comment HSR18.084 - Provide duplicate elevatoring to allow for elevator maintenance without impacting ambulatory disabled access to platform	05/04/22	AK	C	The number of elevators are provided in Section 21.4, which states that there will be a minimum of two elevators connecting the street level to mezzanine/concourse level and the mezzanine/concourse level to the platform level. Section 21.4 also states that the platforms will remain fully accessible even when one elevator is out of service.							05/18/22	CC
HSR.045	Section 2.1.2.f, 2-1 & Section 20.1, 20-1	XB	10/01/18	LEGACY Comment HSR18.021 - 2.1.2 F and 20.1 - Confirm that the Fourth and Townsend Street Station is to accommodate Caltrain service only. HSR requires usage at the Fourth and Townsend Station.	05/04/22	AG	A	Revised text to read: "…shall accommodate both Caltrain commuter and high-speed train service."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
TA.001	Section 14.1.3.2 (First list, Second bullet)	LZ	07/04/22	Add Clipper (or other regional system) card charging stations	09/13/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.002	Section 14.1.3.2 (Second list, Third bullet)	LZ	07/04/22	Urinals with stalls, doors and security latches?	09/22/22	OA	A	Revised to read as "Urinals with stall"				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.003	Section 14.1.3.3 (Second to last bullet)	LZ	07/04/22	Caltrain platforms are 21.7" above rail	09/13/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.004	Section 14.2, Fourth and Townsend Street Station	LZ	07/04/22	This is more complicated than it appears. Integrating with 4th and King station avoiding redundancy may result in shortfall once/if the existing station is eliminated and replaced at a later time with a different configuration	10/05/22	MJS	A	Revised sentence for clarity/intent.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical and the revised sentence was accepted.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.005	Section 14.2.1.1 (Last bullet)	LZ	07/04/22	Delete last bullet. It has HSR transfering to itself	09/13/22	MJS	B	Disagree, riders getting off at Fourth and Townsend Street Station can be either Caltrain or CHSRA passengers. Certainly they can transfer from CHSRA to Caltrain and vice versa.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed that the bullet should be deleted.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and the responder revised their response to address comment; therefore this comment is considered closed.	10/05/22	CC
TA.006	Section 14.2.1.3 (Fifth bullet)	LZ	07/04/22	Statement implies that the distance from center of track and platform face is the same for both operatirs. Is that the case?	09/13/22	MJS	B	Disagree, there is a subheader "Caltrain" above this list under section (14.2.1.3, Platforms). PMPC Team belives this clearly refers to Caltrain dimensions only.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical and the revised sentence was accepted.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.007	Section 14.2.2.1, Concourse Level	LZ	07/04/22	Why would DTX provide bus operator facilities at 4th/Townsend? Is this even in the scope? If MTA wants them, who pays for them? At STC they already exist	09/13/22	MJS	B	Disagree, the criteria reads "Bus operator facilities may also need to be provided, but this decision is pending with SFMTA.". The intent of this language is to make the designer aware of the potentiality, not the requirement.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical and the revised sentence was accepted.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.008	Section 14.3.2.1 (2nd bullet under Caltrain Facilities)	LZ	07/04/22	Parking for three ladder rack trucks at the lower concourse level?	09/22/22	OA	A	Revised to "street level" (original sentence WAS NOT exactly like note says here. Still made edit to "street level")				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**41**
Comments Closed	**41**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 15, Fire-Life Safety*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
John Bumanis (Design Team/Parsons)	JB	Randy Volenec (Design Team/PC Parch)	RV
Yiming Sun (Design Team/MJA)	YS	Bin Zhang (Caltrain)	BZ
Pete Gutierrez (Caltrain)	PCG	Joel Pancoast (Caltrain)	JP
James Deane (CHSRA)	JRD	M. Brunner (CHSRA)	MBr
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Nader Shahcheraghi (PMPC SME/ AECOM)	NS		

AC – Action Code
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ROK – response okay
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	15.1 - Design Fire Size	JB	04/08/22	Consider keeping the table that is currently provided in the 2009 edition of the criteria. This Table presents information (e.g. MW for trash) that isn't in the RVA criteria. The train fire heat release rate and growth rate are also consistent with the current SES/CFD work being performed.	05/17/22	NS	A	Added the table back into section 15.1.	08/05/22	BCC	The train fire heat release rate and growth rate (and current SES/CFD modeling work) requires further discussion	10/06/22	MJS	Noted. Design Criteria can be updated after further discussion considering SES and CFD analysis modeling. CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
GEC.002	15.1 - Design Fire Size, ¶1-1	JB	04/08/22	Revise first sentence to read as follows: "In addition to data provided in Table 15.1, the tunnel.."	05/17/22	NS	A	The intro sentence reads: "Design fire sizes are shown in Table 15.1." The following sentence appears after the table: "In addition to the design fire sizes shown in Table 15.1, tunnel and station design must accommodate the fire sizes indicated in the Program's Final Risk and Vulnerability Assessment."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	15.1 - Design Fire Size, ¶1-1	JB	04/08/22	Return Table 15.1 Design Fire Sizes to section.	05/17/22	NS	A	Done				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	15.2.b - Emergency Management (Public address system)	RV	04/08/22	Note: Transit Center is equipped with an Emergency Communications System/Mass Notification System that operates over the PA system.	05/17/22	NS	C	Noted.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	15.4.3 - Station Deluge System, ¶1-1	RV	04/08/22	Revise first sentence to read as follows: "… in the Fourth and Townsend Street Station and the Transit Center."	05/17/22	NS	A	Done				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	15.6 - Blue Light Station, ¶2, fifth bullet	JB	04/08/22	Add bullet "120 volt duplex convenience electrical outlet (see electrical criteria)	05/17/22	NS	A	Done				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	Sect. 22	YS		LEGACY Comment GEC18.109 - This chapter does not provide any requirements of fire resistance from the structural performance perspectives such as adding micro pp fibers in the concrete mix for the final lining. Should this be required?	02/28/22	NS	C	SME Nader Shahcheraghi: "NFPA 130 (2020) Sections 5.2 and 6.2 specify construction types acceptable for stations and tunnels, respectively. The fire resistance rating of the underground structures are specified in these sections through construction type. Also, the second paragraph of the Scope indicates that fire resistant construction criteria is provided in the Structures chapter of the DCM."	05/04/22	ROK	No additional comment				05/04/22	CC
GEC.008	Paragraph 22.4	JB		LEGACY Comment GEC18.110 - Consider prohibiting embedded fire suppression system piping.	02/28/22	NS	A	This requirement is likely intended to facilitate the ease of maintenance and repair of fire protection system piping and should be considered in the design of this system.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.009	22.7.2	JB		LEGACY Comment GEC18.111 - Define fire rating (e.g. 2 hours) of enclosure.	02/28/22	NS	A	SME Nader Shahcheraghi: "According to NFPA 130, Section 6.3.3.10, 'exit stairs and doors shall comply with Chapter 7 of NFPA 101, except as herein modified.' Fire rating depends on the number of floors and other factors, such as if there are cross-passage doors." Added language in Section 14.7.2 to address this.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.010	Chapter 22/23-General	JB		LEGACY Comment GEC18.108 - Per NFPA 130 paragraph 7.2.6.1 "The criteria for tenability and time of tenability for stations and trainways shall be established and approved." Tenability criteria and time requirements need to be developed and incorporated into the criteria.	02/28/22	NS	DE	NFPA 130 provides guidance on tenability criteria in section B.3. Required time of tenability shall be developed for each station based on input from fire department and first responders as well as for developing the Emergency Response Plan.	05/16/22	ROK					05/16/22	CC
GEC.011	Chapter 15 - General	JB	06/23/22	Consider prohibiting embedded fire suppression system piping.	09/20/22	NS	A	No objection to request. Revised as noted (Section 15.4.1 and 15.4.2)	10/06/22	ROK	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to address comment in the DTX Design Criteria.	10/06/22	MJS	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to address comment in the DTX Design Criteria. Comment is considered closed.	10/06/22	CC
GEC.012	15.1	JB	06/23/22	This section requires that the design train fire size and growth rate conform to the fire sizes indicated in the Transbay Program's Final Risk and Vulnerability Assessment. This may not be feasible with the current system. In addition, the fire heat release rates mandated by RVA criteria are higher than what is being used for the current SES/CFD task.	09/20/22	NS	B	See response to item GEC.001 Fire size and growth rate should be based on the design rolling stock and can not be determined arbitrarily based on what is feasible for the current system. The system should be designed to meet the design criteria, not the other way around.	10/06/22	ROK	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed treat this comment in same fashion as GEC.001.	10/06/22	MJS	Noted. Design Criteria can be updated after further discussion considering SES and CFD analysis modeling. CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
GEC.013	15.2 Emergency Manangement	CU	07/01/22	Include the Transit Center in the first paragraph of section 15.2	09/30/22	MJS	A	Revised as follows: "Caltrain's Central Control Facility (CCF) will have the ability to manage all emergency situations occurring in the tunnel and, the Fourth and Townsend Street Station, and portions of the Salesforce Transit Center Station (pending the master cooperative agreement and future CONOPS agreements)."				10/04/22	MJS	The responder (PMPC Team) provided clarification to original comment inquiry, no change required - comment is considered closed.	10/04/22	CC
GEC.014	15.7.1 Walkways	LY	08/03/22	In reference to bullet point " Have handrails, the handrails must not obstruct egress from trains." Are we showing handrails on emergency egress walkways in the tunnel?	09/30/22	MJS	C	The PE design of tunnel cross-sections that have been reviewed by PMPC Team have included handrails along the length of the walkway (except at egress points). The handrails are located against the tunnel wall, not between the train and the walkway so they will not impede egress.	10/06/22	ROK	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Design team agreed with PMPC response.	10/04/22	MJS	The responder (PMPC Team) provided clarification to original comment inquiry, no change required - comment is considered closed.	10/04/22	CC
GEC.015	15.7.1 Walkways	LY	08/03/22	Following bullet "Include signage at regular intervals that indicates the emergency egress direction and distances to the nearest exits in both directions." Clearly identified cross-passageway doors within the partitioned tunnel section	09/30/22	MJS	A	Revised as follows: "Have handrails; the handrails must not obstruct egress from trainsmust be located opposite of track, adjacent to tunnel wall, and not obstruct egress from trains. " (Matt edited this, should I change it back?)				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Cal.001	Chapter 15	BZ	04/21/22	Reconcile chapter number with section 1.6 Design Criteria Organization; renumber chapter subsection accordingly	05/13/22	AK	A	Chapter 1 has been updated to reflect current chapter organization.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Chapter 15	BZ	04/21/22	AREMA	05/13/22	AK	A	AREMA Manual for Railway Engineering is the third bullet under Codes, Standards and Guidelines	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.003	Chapter 15.4	BZ	04/21/22	Reference NFPA 14	05/13/22	AK	C	NFPA 14 is listed as a reference	05/17/22	ROK					05/17/22	CC
Cal.004	Chapter 15.6	BZ	04/21/22	Coordinate chapter numbering	05/13/22	AK	A	Chapter numbering will be coordinated during production.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.005	Chapter 15 Section 15.7.1; (Page 15-9 of 10)	PCG	06/21/22	With the exception of walkways between tracks, hand rails are required on all walkways within tunnels and subways.	09/13/22	MJS	A	Revised as follows: "Have handrails; the handrails must not obstruct egress from trainsmust be located opposite of track, adjacent to tunnel wall, and not obstruct egress from trains. "				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.006	Chapter 15 Section 15.7.1; (Page 15-9 of 10)	JP	06/30/22	revise 5th bullet; handrails to be located opposite of track, adjacent to tunnel wall	09/13/22	MJS	A	Revised as follows: "Have handrails; the handrails must not obstruct egress from trainsmust be located opposite of track, adjacent to tunnel wall, and not obstruct egress from trains. "				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.007	Chapter 15 Section 15.7.2; (Page 15-9 of 10)	JP	06/30/22	second sentence; include San Francisco Building Code	09/13/22	MJS	A	Revised as noted.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.001	15 - General	JRD	04/15/22	smoke detectors- consider dust for detectors in platforms	05/17/22	NS	A	Noted. Added to smoke detectors section in 15.3.2.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.002	15 - General	JRD	04/15/22	Add FRA accessibility requirements	05/17/22	NS	A	Added: •Federal Railroad Administration (FRA) Accessibility Standards Applying to Passenger Rail Cars				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.003	15 - General	JRD	04/15/22	Confirm NFPA 101 requirements apply- I see only one reference to doors but those will be governed by CBC	05/17/22	NS	C	NFPA 101 applies where NFPA 130 references it.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.004	15 - General	JRD	04/15/22	Where are you using NFPA 101A?	05/17/22	MM	A	Removed reference to NFPA 101A.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.005	15 - Codes and Standards	JRD	04/15/22	Is NFPA 101 actually used by the CBC? NFPA 130 defers CBC is NFPA 101 is not adopted	05/17/22	NS	C	NFPA 101 is used where NFPA 130 references it.	05/17/22	ROK					05/17/22	CC
HSR.006	15.1	JRD	04/15/22	When will risk assessment be provided	05/13/22	AK	C	The Risk and Vulnerability Assessment is being rebranded as the Threat and Vulnerability Assessment and will be ready by July 6, 2022.							05/17/22	CC
HSR.007	15.2	JRD	04/15/22	Consider requirements to require radio repeaters and to require contractor to demonstrate all spaces have a minimum signal strength. This applies to Wi-Fi as well	05/13/22	NS	C	I believe this is implied for radio communications systems related to fire emergency conditions. For non-emergency operations such as maintenance work and Wi-Fi coverage this suggestion should be evaluated by owner with input from designer and will be included in the project specifications, not the design criteria.							05/17/22	CC
HSR.008	15.3.2.3	JRD	04/15/22	Consider requiring cctv coverage for manual pull stations in public areas or pullboxes with integrated cameras	05/13/22	NS	A	No objection to request. Added criteria to section 15.3.2.3.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.009	Section 22.2 22-2	MBr		LEGACY Comment HSR18.056 - 22.2 Emergency Management - should include wayside information obtained via the onboard diagnostics and health monitoring system which included smoke, fire and heat monitoring and fire extinguishing systems.	02/28/22	NS	A	Designer should refer to NFPA 130 for life safety equipment requirements needed in transit or rail systems. Smoke and heat detectors are appropriate in station buildings only, not in the tunnel structures.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.010	Section 22.4.1, 22-6	MBr		LEGACY Comment HSR18.057 - 22.4.1 Standpipe - will standpipes be located at station platform tracks?	02/28/22	AK/NS	A	Fire hose cabinets will be provided on the platforms, but not at the tracks themselves. Standpipe outlets will be provided every 200 feet. (NS) NFPA 14 requires a standpipe at each end of each platform.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.011	Section 22.4.3, 22-7	MBr		LEGACY Comment HSR18.058 - 22.4.3 Station Deluge System - An under-vehicle water spray system - highspeed trainsets will have under vehicle / bottom covers for aerodynamics purposes and EMU will be of a bi level design which will have very low floor pans and will have the major traction systems inside the car this under vehicle approach needs to be evaluated for its' limited effectiveness.	02/28/22	MJS	B	Under-vehicle deluge system will accommodate Caltrain EMU per Caltrain PCEP criteria.				05/17/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/17/22	CC
TA.001	Section 15.2, Emergency Management	LZ	07/04/22	States "Local control will also be provided for certain emergency management functions." very vague statement. functions that need local control have to be specified	09/20/22	NS	A	revise statement as follows: Local control shall be provided such that incident command (fire department) arriving at the incident can over-ride remote control and can control emergency response provisions as follows: Emergency Ventilation System, Fire Detection and Alarm System, Public Address System Standpipe System.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.002	Section 15.2, Emergency Management	LZ	07/04/22	The list of systems does not have CCTV	09/13/22	MJS	A	Revised as noted.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.003	Section 15.2.1, Ventilation System Monitoring and Control	LZ	07/04/22	This section implies that there will be work at the Caltrain CCF by/for the DTX. Is this in the DTX scope/budget?	09/20/22	MJS	C	The interfacing capabilities of Caltrain are not currently captured explicitly in the scope/budget of the DTX project but are accounted for in contingencies. The precise interface requirements and scope will need to be determined and agreed upon between TJPA and the operators during the next phase of design.				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation on original comment and will agree to carry this concept onto the next phase of design for interface management; therefore this comment is considered closed.	10/07/22	CC
TA.004	Section 15.3.2.2, Automatic Fire Detection Devices	LZ	07/04/22	The list of locations where fire detection devices must be installed does not include STC. Were they installed in phase 1?	09/14/22	MM	A	Revised as noted.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.005	Section 15.3.2.3, Manual Fire Alarm Pull Stations	LZ	07/04/22	States that manual fire pull stations are to be located in the free areas of stations. How about paid areas?	09/20/22	NS	A	Revised as noted.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.006	Section 15.3.2.3, Manual Fire Alarm Pull Stations	LZ	07/04/22	Mentions what happens with the escalators when an alarm is activated, but does not have the same for elevators	09/20/22	NS	A	Added the following paragraph: "All elevators in the station must automatically go to a pre-determined floor within 90 seconds after activation of the manual pull station. The elevators must be coordinated with the fire department to allow override control. Station platforms must have emergency waiting area(s) for mobility-impaired passengers to wait for fire department to assist with evacuation. The designer must demonstrate tenability of emergency waiting area(s) for a period no less than the required time of tenability as determined by the fire department."				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.007	Section 15.7.1, Walkways	LZ	07/04/22	Specifies walkways 400 ft apart. Is three in the whole station adequate?	09/20/22	MJS	C	400 feet separation of walkways is sufficient because each platform must have emergency egress/exiting to meet NFPA requirements (4-min to clear from furthest point). There should be no need for passengers at platform level to cross tracks to evacuate in the event of an emergency.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC
TA.008	Section 15.8, Fourth and Townsend Street Station	LZ	07/04/22	Should have the same subsections as the STC section	09/14/22	MM	A	Revised title of section 15.8 to "Underground Stations". Added "Salesforce Transit Center Station" to first sentence.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 50
Comments Closed 50
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 16, Mechanical Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
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M. Brunner (CHSRA)	MBr	Bin Zhang (Caltrain)	BZ
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
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Matt Schreffler (PMPC/Mott MacDonald)	MJS	Nader Shahcheraghi (PMPC SME/ AECOM)	NS

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	16.1.1	JB	04/21/22	1) Section 16.1.5.2 discusses by-pass dampers but does so in the context of temperature control and only if necessary (i.e. "Where necessary during normal operations, bypass shafts must allow air exchange between the outside ambient and the tunnel."). Since both stations will be mechanically ventilated during normal operations, additional by-pass dampers and shafts do not appear to be required to ensure air exchange between the outdoors and the stations. Please verify. 2) Also, there is no requirement in this paragraph or criteria chapter regarding the need for any blast or piston action relief shafts. Please verify that piston action relief is not necessary.	05/17/22	NS	DE	In addition to temperature control, relief shafts may be required to control pressure transients due to portal entry/exit or sudden expansion/contraction of tunnel cross sectional area. Alos, piston effect could cause excessive velocity in stations if piston effect is relieved only through the stations. So the designer should evaluate, using engineering analysis, the need for relief shafts based on these requirements, in addition to temperature control.	08/05/22	BCC	Doesn't address issue associated with requirement for air exchange through by-pass dampers.	10/06/22	MJS	What requirements for air exchange through by-pass dampers, other than those for temperature control and pressure transient control? Please elaborate. **CRM held with John B., Nader S., and Matt S. on 10/6/22** - Currently there is no bypass provisions at the DTX stations. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
GEC.002	16.1.2 - 3 rd paragraph	JB	04/21/22	It would be beneficial if the number and locations of stalled trains were defined. This would further clarify the requirement for the designer	05/17/22	NS	DE	Since the exact location of stalled trains cannot be determine apriori, the designer should determine the worst location among possible locations for design purposes.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	16.1.3	JB	04/21/22	This section essentially describes emergency ventilation operating in a longitudinal push-pull mode. Should also include discussion and description regarding the single point extract mode of operation.	05/17/22	NS	A	If single extract mode is anticipated in a particular location this content shall be added.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	16.1.4.3	JB	04/21/22	This section requires that the design train fire size and growth rate conform to the fire sizes indicated in the Transbay Program's Final Risk and Vulnerability Assessment. This may not be feasible with the current system. In addition, the fire heat release rates mandated by RVA criteria are higher than what is being used for the current SES/CFD task.	05/16/22	AK	A	The Final Risk and Vulnerability Assessment is being rebranded as the Threat and Vulnerability Assessment (TVA) and is currently in the process of being updated. The design train fire size and growth rate will be verified after the assessment is complete.	08/05/22	BCC	This topic requires further discussion	10/06/22	MJS	**CRM held with John B., Nader S., and Matt S. on 10/6/22** - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic and ensure consistency across all project documents (DTX DCM, TVA, designs, and models) as an action item during the next phase of design.	10/06/22	CC
GEC.005	16.2.2	JB	04/21/22	This section states that Fourth and Townsend Street Station must be naturally ventilated using the following requirements from San Francisco Municipal Transportation Agency's criteria for the Central Subway project: - The maximum temperature is 10 degrees above ambient temperature. - No heating is required. This conflicts with sections 16.2.2.1 and 16.2.4.1 that discuss heated and conditioned air. It is our understanding that requirements for heating and cooling have been eliminated.	05/17/22	MM	A	Edit has been made to note "where applicable" for the HVAC, the natural ventilation is listed for the Fourth and Townsend St. Station.	08/05/22	BCC	This topic requires further discussion - potential conflict still exists	10/06/22	MJS	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close address comment in section 16.2.2.1 and 16.2.4.1. Revised as noted.	10/06/22	CC
GEC.006	16.2.2.2, 16.2.2.3	JB	04/21/22	It's our understanding that the maximum air velocity in ducts, plenums and shafts serving the emergency tunnel ventilation system is 2500 feet per minute.	05/17/22	NS	A	Preferred maximum is 2000 fpm. 2500 fpm will be considered if site limit does not allow for 2000 fpm. Text has been updated accordingly.	08/05/22	BCC	This topic requires further discussion - text still refers to 2000 fpm maximum	10/06/22	MJS	2000 fpm is the **preferred** maximum when site conditions allow it. CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to modify criteria language - comment is considered closed.	10/06/22	CC
GEC.007	Chapter 23 - General	JB	10/01/18	LEGACY Comment GEC18.112 - A requirement for the "cold flow" simulations required in 2107 NFPA 130 paragraph 7.13 needs to be incorporated into this chapter.	04/06/22	NS	C	The project is required to be NFPA 130 compliant, therefore this requirement is implied.		ROK	Concur				05/16/22	CC
GEC.008	Paragraph 23.1.2	JB	10/01/18	LEGACY Comment GEC18.113 - 4th paragraph states that "In the event that congested conditions necessitate a passenger evacuation, the fan speed shall be set to maintain passenger comfort levels." Need to define comfort level temperature in the criteria.	04/06/22	NS	A	Fourth paragraph has been changed to the following, per SME Nader Shahcheraghi's direction: If congested conditions necessitate a passenger evacuation, this will be deemed an "emergency operation and the fan speed will be set to maintain a tenable environment per NFPA 130 conditions.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.009	Paragraph 23.1.4.2	JB	10/01/18	LEGACY Comment GEC18.114 - Clarify, specify the outdoor temperature (83 F or 103 F) corresponding to the 105F tunnel temperature.	04/06/22	MJS/NS	A	Maximum design outdoor temperature will assume 109*F accounting for climate change warming projections as stated in the California's Fourth Climate Change Assessment - San Francisco Bay Area Region Report". SME has approved this response.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.010	Paragraph 23.1.5.	JB	10/01/18	LEGACY Comment GEC18.115 - Unlike a fan located in a vent building, jet fans could be directly exposed to a fire. Add requirement for redundancy, (e.g. extra pair)	04/06/22	NS	C	The project is required to be NFPA 130 compliant, therefore fan redundancy is implied. The jet fan(s) directly exposed to tunnel fire incident must be assumed to be out of service and additional jet fan(s) must be provided to back up the operating jet fan(s).		ROK	Concur				05/16/22	CC
GEC.011	Paragraph 23.4.2 Floor and Area Drains – 3rd paragraph	JB	10/01/18	LEGACY Comment GEC18.116 - Note that drains located in both elevator and escalator pits should be equipped with an oil/water separator to prevent contaminating the track drain and the city sewer. The AHJ may also have requirements regarding draining elevator pits that should be referenced here.	04/06/22	NS	A	No objection to the oil/water separator provision in elevator/escalator pits to control contamination of drainage system. This type of drainage should be sent to sanitary sewer system.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.012	General	JB	10/11/21	LEGACY Comment PMPC.002 - Cooling Variance - see email from John Bumanis dated 10/11/2021	04/06/22	MJS	A	Station ventilation has been addressed per John Bumanis' 10/11/21 email	05/18/22	ROK	Concur	05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.013	Chapter 22/23-General	JB	10/01/18	LEGACY Comment GEC18.108 - Per NFPA 130 paragraph 7.2.6.1 "The criteria for tenability and time of tenability for stations and trainways shall be established and approved." Tenability criteria and time requirements need to be developed and incorporated into the criteria.	04/06/22	NS	A	NFPA 130 provides guidance on tenability criteria in section B.3. Required time of tenability shall be developed for each station based on input from fire department and first responders as well as for developing the Emergency Response Plan.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.014	16.1.3 Emergency Operations	CU	07/01/22	Cite NFPA 130 requirements for cooridnation with signal system	09/20/22	NS	A	NFPA 130, 2020 section: 7.2.5* The design and operation of the signaling system, trac- tion power blocks, and ventilation system shall be coordinated to match the total number of trains that could be between ventilation shafts during an emergency.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.015	16.1.6.2	JB	06/23/22	1) Section 16.1.6.2 discusses by-pass dampers but does so in the context of temperature control and only if necessary (i.e. "Where necessary during normal operations, bypass shafts must allow air exchange between the outside ambient and the tunnel."). Since both stations will be mechanically ventilated during normal operations, additional by pass dampers and shafts do not appear to be required to ensure air exchange between the outdoors and the stations. Please verify. 2) Also, there is no requirement in this paragraph or criteria chapter regarding the need for any blast or piston action relief shafts. Please verify that piston action relief is not necessary.	09/20/22	NS	C	Piston action relief is necessary. Please see PMPC response dated 05/17/22 to item GEC.001				10/06/22	MJS	What requirements for air exchange through by-pass dampers, other than those for temperature control and pressure transient control? Please elaborate. **CRM held with John B., Nader S., and Matt S. on 10/6/22** - Currently there is no bypass provisions at the DTX stations. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 50
Comments Closed 50
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 16, Mechanical Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
John Bumanis (Design Team/Parsons)	JB	Elena Lasheras (CHSRA)	EL
M. Brunner (CHSRA)	MBr	Bin Zhang (Caltrain)	BZ
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Nader Shahcheraghi (PMPC SME/ AECOM)	NS

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GEC.016	16.2.2	JB	06/23/22	This section states that Fourth and Townsend Street Station must be naturally ventilated using the following requirements from San Francisco Municipal Transportation Agency's criteria for the Central Subway project: - The maximum temperature is 10 degrees above ambient temperature. - No heating is required. This conflicts with sections 16.2.2.1 and 16.2.4.1 that discuss heated and conditioned air. It is our understanding that requirements for heating and cooling have been eliminated.	09/20/22	NS	A	The terms' heated and conditioned air' will be changed to 'naturally ventilated.'			CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close address comment in section 16.2.2.1 and 16.2.4.1. Revised as noted.	10/06/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/06/22	CC
HSR.001	Chapter 23 - Mechanical Systems; Section 16.4 (Drainage Systems) (Page 32 of 34)	EL	04/28/22	Please incorporate the following requirements in this section: - Tunnel track drainage system shall effectively collect and remove water from the tunnel resulting from condensation, groundwater leakage, rain entering the tunnel, spilled water, fire-fighting activities, cleaning, and other sources. - Runoff from outside the tunnels shall be prevented from entering the tunnel. - Drainage for tunnel track section shall be accommodated in a trough with cover or pipe in the center of the trackway tunnel slab based on a gravity drainage system. - Critical facilities, such as traction electrification system, automatic train control, communications, portal sites and facilities, vent structures, traction power supply sites, operations control centers, etc. shall be designed so that the finish floor elevation or top of slab foundation of these facilities are a minimum of 2 feet above 100-year floodplain or six inches above 500-year floodplain, whichever is greater.	05/17/22	NS	A	Track drainage shall be per NFPA 502 section 7.12 and additional requirements listed here shall be added to supplement the track drainage requirements.	06/24/22	ROK		06/24/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	06/24/22	CC
HSR.002	Chapter 23 - Mechanical Systems; Subsection 23.1.1.14 (Inlets and Piping) (Page 33 of 34)	EL	04/28/22	Per CHSRA Design Criteria Manual Rev. 5.0, the minimum diameter of the track drainage system shall be 12 inches.	05/17/22	NS	A	Noted.	06/24/22	ROK		06/24/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	06/24/22	CC
HSR.003	Chapter 23 - Mechanical Systems; Subsection 23.1.1.14 (Inlets and Piping) (Page 33 of 34)	EL	04/28/22	Recommend not limiting track drain pipe materials to fiberglass.	05/17/22	NS	DE	No objection the request. Designer to evaluate	06/24/22	ROK		06/24/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	06/24/22	CC
HSR.004	Section 23.1.2, 23-6	MBr	10/01/18	LEGACY Comment HSR18.059 - 23.1.2 Congested Operations - ceiling heights should be known? See below 23.2.3.1	04/06/22	NS	A	The ceiling height will be determined by the architectural and structural designers. However, sufficient air temperature should be maintained to ensure wayside equipment such as train air conditioning system and condenser units can function during congested operations.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.005	Section 23.1.3, 23-6	MBr	10/01/18	LEGACY Comment HSR18.060 - 23.1.3 Emergency Operations - will any fire suppression / extinguishing systems be available in the tunnels?	04/06/22	NS	A	A standpipe system will be provided in the tunnels per NFPA 14 requirements.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.006	Section 23.1.4.2, 23-3	MBr	10/01/18	LEGACY Comment HSR18.061 - 23.1.4.2 Indoor Design Conditions -No control of air velocity shall be provided during off-service hours. Please provide ventilation for circulation of air during off-service hours, as trainsets will likely be stored at Transbay.	04/06/22	MJS	B	According to DTX Design Criteria Chapter 02 - Owner's Requirements "..the design must assume a 24-hour-per-day operation." It is not known at this time if trainsets will be stored at the transit center. The turnback track allows train movements during off-peak between the DTX and the Fourth and King Railyard for train storage.				05/17/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.007	Section 23.2.3.1, 23-12	MBr	10/01/18	LEGACY Comment HSR18.062 - 23.2.3.1 Air at platform ceiling level - Each 200 meter trainset will be consuming approximately 240 kW during lay over periods and an energy consumption as high as 640 kW plus heat being dissipated from traction heat exchangers when entering the station area during revenue service. Provide details on ceiling heights.	04/06/22	NS/MJS	A	"The ceiling heights will be determined by the structural/architectural design. See comment response to HSR18.059 for addressing tempering of the air temperature." Fourth and Townsend Street Station: CHSRA platform to ceiling: 17.33' Caltrain platform to ceiling: 19.42' TOR to ceiling: 21.25' Salesforce Transit Center Station: *Final architectural fit-out details have not been finalized including potential drop ceiling CHSRA platform to ceiling: approx. 19.28' Caltrain platform to ceiling: approx. 21.58' TOR to ceiling: approx. 23.5'							05/17/22	CC
HSR.008	Section 23.3.1.1, 23-25	MBr	10/01/18	LEGACY Comment HSR18.063 - 23.3.1.1 Potable cold water should be provided at station platform track areas	04/06/22	NS	A	Designers should refer to California Plumbing Code / Mechanical Code for potable cold water requirements at station platforms.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.009	Section 23.3.1.3, 23-26	MBr	10/01/18	LEGACY Comment HSR18.064 - 23.3.1.3 Soil and Waste system - access for unscheduled on board waste holding tanks servicing shall be provided	04/06/22	NS	A	Designers should refer to California Plumbing Code / Mechanical Code for soil and waste system servicing requirements.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.010	Section 23.3.1.5, 23-26	MBr	10/01/18	LEGACY Comment HSR18.065 - 23.3.1.5 Compressed air system - compressed air shall be made available on station platforms tracks	05/19/22	MM	C	The compressed air system is being provided for the emergency ventilation system. No requirements were found in either Caltrain or CHSRA design criteria for compressed at station platform tracks.							05/19/22	CC
HSR.011	Section 23.4.1.2, 23-31	MBr	10/01/18	LEGACY Comment HSR18.066 - 23.4.1.2 Sump Pits & 23.4.2.2 - Cleanout shall be designed and sized to accommodate the introduction of sand from trainset's / EMU's emergency brake system.	05/19/22	MM	C	A requirement for sand traps is included in Section 23.4.1.2 Sump Pits. Section 23.4.2.2 Cleanout is for floor drains in the stations where sand should not reach.							05/18/22	CC
HSR.012	Section 23.4.2, 23-31	MBr	10/01/18	LEGACY Comment HSR18.067 - 23.4.2 Floor and area drains - station platforms areas shall be designed to drain HVAC condensation water.	04/06/22	NS	C	HVAC condensation is typically collected and conveyed by HVAC plumbing system and can be directed to station drainage system. Station platform area drains are typically sized per station cleaning/washing. If the platform is sprinklered the design condition for the drainage system is based sprinkler discharge rate, as determined by system designer.							05/17/22	CC

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Cal.001	Chapter 16	JP	04/29/22	reconcile chapter number with section 1.6 Design Criteria Organization; renumber chapter subsection accordingly	05/13/22	AK	A	Chapter numbering will be coordinated during production.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Chapter 16.2.6.12	JP	04/29/22	include; essential service	05/17/22	MM	C	Fire/life/safety systems are already included in the list. Note that comprehensive seismic requirements are included in Ch. 10.							05/17/22	CC
Cal.003	Chapter 16.2.6.12	JP	04/29/22	include; using an importance factor (Ip) of 1.5	05/17/22	NS	A	No objection the request. Designer to evaluate				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
Cal.004	Chapter 16.2.6.12	JP	04/29/22	include; Non-essential mechanical systems in conformance with the seismic provisions of the CBC may be designed using an importance factor (Ip) of 1.0	05/17/22	NS	A	No objection the request. Designer to evaluate				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
Cal.005	Chapter 16.1.3	BZ	04/29/22	Ventilation system design for emergency operations should be reviewed by an independent peer.	05/17/22	NS	A	Emergency Ventilation System shall be reviewed by PMPC Subject Matter Expert.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
Cal.006	Chapter 16 Section 16.1.5.3; (Page 16-4 of 34)	JP	06/30/22	Include with NFPA 130 section 7.2.2 Single Point Extraction	09/20/22	NS	A	Revised as noted.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
Cal.007	Chapter 16 Section 16.1.5.3; (Page 16-4 of 34)	JP	06/30/22	Provide sub-section number for 'Design Air Velocities' following Evacuation Route Air Velocity paragraph	09/20/22	MJS	C	The PMPC Team (and TJPA) have developed a project document template that only allows 4 levels of numbering. Subheaders have been created to distinguish between subtopics. No change required.				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/07/22	CC
TA.001	Section 16.1.3, Emergency Operations	LZ	07/04/22	States that emergency operations are triggered by fire, but there are many other scenarios for emergencies, such as derailment, terrorist activities, accidents, etc	09/20/22	NS	A	Revised section 16.1.3 - Fire Emergency Operations and modified language within. All non-fire emergencies will operate under maintenance and train recovery operations.				10/06/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/06/22	CC
TA.002	Section 16.1.4, Maintenance and Train Recovery Operations	LZ	07/04/22	Mentions that maintenance operations will be by diesel powered equipment. Should consider battery operated or hybrid	09/13/22	MM	C	At this time, Caltrain has informed TJPA that they plan to continue use of their current maintenance equipment which is diesel. As noted, diesel is a less clean source so this is a conservative approach. If Caltrain changes position in the future, the design criteria can be updated.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA accepts PMPC response. Ventilation system must handle deisel exhaust caused by maintenance vehicles to maintain safe/clean air within underground structures.	10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/07/22	CC
TA.003	Section 16.1.5.3 (Exhaust Air At Sidewalk Level)	LZ	07/04/22	Implies that there will be exhausts at sidewalk gratings. I thought they were no longer allowed	09/14/22	MM	A	Agree. Section to be deleted.				10/06/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/06/22	CC
TA.004	Section 16.1.6.1, Fans (Axial Flow Fans, second to last bullet)	LZ	07/04/22	Rephrase sentence	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.005	Section 16.1.6.1, Fans (Axial Flow Fans, last sentece before "Jet Fans" subsection)	LZ	07/04/22	States "Do not include provisions for stand-by fans". Explain why	09/20/22	NS	A	Sentence deleted.				10/06/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/06/22	CC
TA.006	Section 16.1.6.6 (first bullet)	LZ	07/04/22	Specifies 50 lb maximum force for opening the doors. Is that adequate for most people?	09/20/22	NS	C	This is NFPA 130 requirement. It assumes that person(s) with this ability will be among the evacuees.				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/07/22	CC
TA.007	Section 16.1.6.6 (last bullet)	LZ	07/04/22	Add "and the STC control center". All functions that happen within the center must have the ability to be monitored at the STC in addition to the CCF	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.008	Section 16.2.6.4, Flexible Duct Connectors	LZ	07/04/22	State the acceptable materials for flexible duct connectors	09/20/22	NS	C	Industry standard is that specific materials shall be selected by the designer based on available products in the market.				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/07/22	CC
TA.009	Section 16.3.1, Functional Requirements (first para)	LZ	07/04/22	Add "plumbing system will also collect, convey and dispose of water infiltration at all underground structures"	09/20/22	NS	B	Added the following sentence: "The plumbing system must also collect, convey and dispose of infiltrated water in underground structures, independent from the tunnel drainage system (see Section 16.4.1)."				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/07/22	CC
TA.010	Section, 16.3.1.2 (second para)	LZ	07/04/22	Why tank heaters? instant water heaters are more efficient	09/20/22	NS	A	Tankless water heaters will be added to the choices so the desiger can use this type if appropriate.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.011	Section 16.3.2.5, Pipe Supports, Hangers, Guides and Anchors	LZ	07/04/22	Include provisions for water hammer where necessary	09/20/22	NS	A	Revised sentence to read as follows: "Consider the forces caused by the weight and motion of the fluid, water hammer forces, the weights of piping, valves and insulation, and thermal expansion and contraction in the design, as appropriate. "				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.012	Section 16.3.3.1, Fixtures	LZ	07/04/22	Specify type of flush valves to be used. Suggest automatic	09/20/22	NS	A	Revised as noted				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.013	Section 16.4.1, Tunnel Drainage Systems	LZ	07/04/22	Add "drainage system will be designed to efficiently collect and remove all water infiltration resulting from a failure of the structures' waterproofing."	09/20/22	NS	A	(NADER, Please let me know if we need to get our tunnel and/or structural SME involved with this conversation ASAP) NS: Yes, we need to discuss with tunnel and structural team to determine the water quantity in case of waterproofing failure. (NLV) Invariably, leakage will occur - structures chapter includes intrusion flow rate - see TABLES 12.3 & 13.1				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.014	Section 12.9, Watertightness and Leakage Mitigation	LZ	07/04/22	Although designing for watertightness, design should provide for collection and removal of any water infiltration due to failure of the waterproofing	10/01/22	MJS	A	Drainage and Plumbing system requirements in Chapter 16, Mechanical Systems is referenced and requires collection, conveyance, and removal of infiltrated water.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC
TA.015	Section 12.10, Drainage	LZ	07/04/22	Drainage system must be design to handle water infiltration over and above the allowable infiltration rates	10/01/22	MJS	A	Drainage and Plumbing system requirements in Chapter 16, Mechanical Systems is referenced and requires collection, conveyance, and removal of infiltrated water.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	17.6	LY	08/03/22	Section 17.6 Disconnect Switches has an extra linespace between frist and second line of text.	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.001	Chapter 17	JP	04/29/22	reconcile chapter number with section 1.6 Design Criteria Organization; renumber chapter subsection accordingly	05/13/22	AK	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Chapter 17.4.1.1	JP	04/29/22	insert; Illumination of emergency lighting shall conform to section 17.4.1.6.	05/13/22	AK	A	Will comply.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.003	Section 24.4	DK	10/18/18	LEGACY Comment Cal18.050 - Section 24.4 (general) Update to the whole lighting section for new lighting technology developed since 2009.	04/06/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Chapter 3, Section 3 (pps 3-35] and the Caltrain PCEP Design Criteria	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.004	Section 24.4.1.1 Table 24.1	BZ	10/18/18	LEGACY Comment Cal18.051 - Table 24.1, Illumination Levels Need an Emergency Lighting level.	04/06/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Chapter 3, Section 3 (pps 3-35, Table 3-2]: "Emergency lighting: aerial (pedestrian overpass), underpasses, stairways, escalators, and elevators - 2-foot candles - minimum."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.005	Section 24.4.3.2	BZ	10/18/18	LEGACY Comment Cal18.052 - Section 24.4.3.2 Lamp Types Why not use LED lamps for lighting?	04/06/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Chapter 3, Section 3 (pps 3-35]:	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.001	Section 24.1.2, 24-2	MBr	10/01/18	LEGACY Comment HSR18.068 - 24.1.2 - HEP wayside to onboard 480v three phase receptacles, cables and control panel	04/06/22	MJS	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.002	Section 24.2.2, 24-4	MBr	10/01/18	LEGACY Comment HSR18.069 - 24.2.2 Emergency power - Provide space for wayside to onboard communication systems and repeaters (if required)	04/06/22	AG	A	Added last paragraph: "Provide space for wayside to onboard communication systems and repeaters (if required)."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.003	Section 24.4, 24-11	MBr	10/01/18	LEGACY Comment HSR18.070 - 24.4 Lighting - Blue Flag protection lights should be added in station platforms track areas to comply with CFR 49 Part 218	04/06/22	MJS	A	Blue Flag protection lights would need to match Caltrain PCEP Design Criteria	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.004	Section 24.4, 24-11	MBr	10/01/18	LEGACY Comment HSR18.071 - 24.4. Lighting - in addition lights should be added to indicate OCS energized & de-energized at station platform track area.	04/06/22	MJS	C	OCS energized indication lights (if required) would need to match Caltrain PCEP Design Criteria - there are no such requirements in the PCEP DCM beyond the following: . The Right of Way does feature line energized warning signage for safety purposes, typically mounted at intervals on the OCS poles. NOTE that this type of indicator type light is typically mounted on TPSS DC Switchgear - at Traction Power Sub Station.							05/24/22	CC
TA.001	Section 17.2.2.1, Emergency Generators	LZ	07/04/22	States: "Generators must be located at street level where possible" Generator in the train box extension is below ground. Even though above ground is possible, it is undesirable. Need to add section for below ground generators	09/14/22	RW	DE	Subsurface generator requirements will be provided during next phase of design				10/04/22	MJS	The responder (PMPC Team) has agreed to incorporate subsurface generator requirements during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
TA.002	Section 17.5, Equipment Location	LZ	07/04/22	Mentions 20% spares for electrical equipment, but where are the provisions for storing spares?	09/14/22	RW	A	Will revise to "Lighting and Power electrical panels must include 20% minimum space circuit breaker quantity."				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.003	Section 17.7.1.3, Public Telehone Power Supply	LZ	07/04/22	Mentions power supply for public phones, but public phones are not mentioned anywhere else in the document	09/14/22	RW	A	Subsection 17.7.1.3, Public Telephone Power Supply removed/deleted.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.004	Section 17.11, Load Flow Analysis (Fourth para, first sentence)	LZ	07/04/22	Replace" toleration" with "tolerances"	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 47
Comments Closed 47
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 18, Rail Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Steve Adkins (Design Team/Parsons)	SRA	E. Mortlock (Design Team/Parsons)	EM
Andrew Clapham (CHSRA)	AC	Philip Gilmour (CHSRA)	PG
X. Banko (CHSRA)	XB	M. Brunner (MBr)	MBr
Rusty Dudley (Caltrain)	RD	Uhila Makoni (Caltrain)	UM
Rick Bartholomew (Caltrain)	RB	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	18	SRA	04/25/22	Recommend including requirements for how the disconnect switches are monitored and controlled.	05/18/22	MJS	A	Added new section18.2.7.1 Disconnect Switches: "Disconnect switches must conform to Caltrain PCEP Design Criteria. The OCS will be equipped with disconnect switches at all primary feeding and bypass feeding locations and monitored by supervisory control and data acquisition system (SCADA), refer to Chapter 19, Communications. All disconnect switches must be motor operated, capable of remote operation and of local motorized or manual operation."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	18	SRA	04/25/22	Recommend including requirements for the type of OCS disconnect switch (i.e. manual, motorized, no-load, load break).	05/18/22	MJS	A	Added new section18.2.7.1 Disconnect Switches: "Disconnect switches must conform to Caltrain PCEP Design Criteria. The OCS will be equipped with disconnect switches at all primary feeding and bypass feeding locations and monitored by supervisory control and data acquisition system (SCADA), refer to Chapter 19, Communications. All disconnect switches must be motor operated, capable of remote operation and of local motorized or manual operation."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	18 - Scope	SRA	04/25/22	It is not clear why there is two paragraphs with details about the voice and train control, but not for other Rail Systems disciplines. It seems out of place.	05/18/22	MJS	A	Revised as noted, content moved to section 18.6 - Signals and Train Control				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	18.1 Design Requirements	SRA	04/25/22	If the only design requirements are for the OCS then why not include under the OCS section.	05/18/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	18	SRA	04/25/22	General comment: Update chapter references and table numbers	05/18/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	18.1.1	SRA	04/25/22	Even though there is a general reference to the PCEP design criteria above, I would include a reference specific to environmental conditions for the at-grade OCS.	05/18/22	MJS	C	Section 18.1.1 already references DTX Design Criteria Chapter 4, Environmental Requirements where this information is described in greater detail. No need to repeat here. Also, PCEP design criteria is referenced.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	18.2.4 OCS and NF Wires	SRA	04/25/22	Recommend spelling out Negative Feeder since NF is not defined elsewhere	05/18/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	18.2.4 OCS and NF Wires	SRA	04/25/22	Wire sizes should be updated to the sizes/types included in the design drawings recently provided by Caltrain.	05/18/22	MJS	A	Section deleted, new section created under 18.3 Overhead Contact System - "18.3.1 OCS Wire Particulars" stating the following: "All wires and cables associated with the DTX OCS must match those used for the Caltrain PCEP. Refer to the Caltrain PCEP Design Criteria and OCS Basic Design Assemblies Tunnel – Overhead Bridge drawing W6001."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	18.2.4 OCS and NF Wires	SRA	04/25/22	States to assume bare wire throughout the system. However, portions of the tunnel may require insulated. What are the Caltrain requirements?	05/18/22	MJS	A	See response to comment #GEC.008				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	18.3 Overhead Contact System	SRA	04/25/22	Which version of the PCEP Design criteria? 2016 version is not up to date and currently being updated.	05/18/22	MJS	C	The 2016 PCEP Design Criteria is the latest version available. A revision of the PCEP Design Criteria is expected in 8-10 months, at which point the DTX Design Criteria will be updated to reflect.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	18.3.2 Foundations	SRA	04/25/22	Recommend including a requirement for the Geotech report in Chapter 9 include an OCS specific section providing lateral soil bearing pressure for OCS foundation design.	05/18/22	MJS	DE	Need to coordinate with Martin Walker to verify if this should be a consideration	08/05/22	BCC	The recommendation to include and OCS-specific section providing lateral soil bearing pressure for OCS foundtation design and other geotechnical requirements in Geotechnical Report(s) in - Chapter 9, Geotechnical requirements was not found.	10/04/22	MJS	See PMPC Additional Response/Next Steps response to comment #GEC.021. The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.012	18.3.3 Clearances	SRA	04/25/22	This requirement was specific to OCS structures. By removing "OCS foundation, pole and structure" it becomes a general OCS clearance requirement and loses the original intent of the requirement.	05/18/22	MJS	A	Revised as follows: "Horizontal and vertical clearances must conform to the requirements of Section 7.3 and will also satisfy CPUC general order 26-D."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.013	18.3.6.1 OCS Type	SRA	04/25/22	Include a specific PCEP reference to the OCS type to be used in the at-grade section.	05/18/22	MJS	A	Revised first sentence to read as follows: "The OCS for the at-grade portion of the DTX must be a simple catenary (messenger and contact wire), automatic tension (A.T.) system and conform to the Caltrain PCEP Design Criteria."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.014	18.3.6.4 Overlaps, Turnouts…	SRA	04/25/22	Change "air-break" to "section insulator." Air-break is also used to refer to an alternate overlap where the contact wires go in and out of running, but do not terminate.	05/18/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.015	Chapter 17	EM	10/01/18	LEGACY Comment GEC18.097 - Third paragraph under Scope; modify to read: "Caltrain is implementing a program to electrify its Peninsula Corridor Service and is also implementing a Positive Train Control (PTC) upgrade of its Signal and Train Control system.	04/06/22	MJS	A	The following DTX Design Criteria Revision Book 01 chapters have been consolidated into new (Rev. Book 02) Chapter 18 - Rail Systems. Chapter 14 - Traction Power Supply and Distribution, Chapter 15 - Voice and Train Control Communications, and Chapter 17 - Signals and Train Control. The content of "Scope" under this new chapter now references the Caltrain PCEP Design Criteria as primary source.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.016	Chapter 17	EM	10/01/18	LEGACY Comment GEC18.098 - Fourth paragraph under Scope; modify the sentence by adding: "and as modified by Caltrain's Electrification Program'.	04/06/22	MJS	A	See comment response GEC18.097.		PAR		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.017	18-1 Codes and Standards	CU	07/05/22	GO-95 title it "Rules for Overhead Electric Line Construction"	09/13/22	MJS	A	Editorial: Will update references globally Did search. This is the only place it is titled				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.018	18.2.1 Design Requirements	SRA	08/03/22	Subsection numbers in the first sentence need updated.	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.019	18.2.2 OCS Wire Particulars	SRA	08/03/22	Drawing W6001 title is "ELECTRIFICATION PROJECT OVERHEAD CONTACT SYSTEM CATENARY WIRES." Overhead Bridge is not included in the drawing package title.	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.020	18.2.6 Electrical Clearances	SRA	08/03/22	The sentence about Absolute Minimum Clearances should be removed since this has been removed from the table.	09/13/22	MJS	A	Revised as follows: "The absolute minimumelectrical clearances, as shown, may only be adopted with the approval of the TJPA and must be achieved maintained at all times consistently under all defined climatic conditions."				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 47
Comments Closed 47
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 18, Rail Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Steve Adkins (Design Team/Parsons)	SRA	E. Mortlock (Design Team/Parsons)	EM
Andrew Clapham (CHSRA)	AC	Philip Gilmour (CHSRA)	PG
X. Banko (CHSRA)	XB	M. Brunner (MBr)	MBr
Rusty Dudley (Caltrain)	RD	Uhila Makoni (Caltrain)	UM
Rick Bartholomew (Caltrain)	RB	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.021	18.2.4 Foundations	SRA	08/03/22	I am not finding comment GEC.011 incorporated in Chapter 9.	10/06/22	MJS	A	Revised section 9.2 - Geotechnical Reporting, under subheading "Geotechnical Interpretive Report (GIR)" to include: "settlementsDeep and shallow foundation design for vertical and lateral loading as well as estimates of settlements for all structures including the tunnel and ancillary items like overhead contact system poles, equipment pads, and operations and maintenance facilities"				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.022	18.3 Voice Radio	LY	08/03/22	First paragraph references "subsection 18.7.1" which does not exist	09/13/22	MJS	A	Revised as follows: "Due to the fact that the tunnel alignment includes multiple horizontal curves, radiating coaxial cable must be used in the DTX tunnel instead of tunnel radios. Requirements for the radiatingThe design and implementation of radiating coaxial cable are in subsection 18.7.1.must conform to the Caltrain PCEP Design Criteria."				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.001	Chapter 14	PG	04/26/2022	No reference is made to the Rail Systems being coordinated with Caltrain and CAHSR infrastructure. Systems such as signaling, traction power and train control must be interoperable.	05/18/22	MJS	A	Revised to add the following: "The design of DTX rail systems must be coordinated with Caltrain and California High-Speed Rail Authority (CHSRA) infrastructure. Signaling, traction power, and train control must be interoperable and fully integrated with Caltrain PCEP corridor. "				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.002	Chapter 14 - 18.2.2	PG	04/26/2022	Load flow analysis must take into account Caltrain and CAHSR services under both normal and degraded situations.	05/18/22	MJS	A	Revised to read as follows: "The DTX design, through a series of traction power load-flow and power supply calculations, must determine whether PS-1 can provide sufficient traction power to the DTX project. Load flow analyses must consider Caltrain and CHSRA operations under both normal and degraded conditions."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.003	Chapter 14 - 18.3.4	PG	04/26/2022	Electrical clearances are not in line with CAHSR minimum electrical clearances. Please advise why CAHSR clearances cannot be achieved.	05/18/22	MJS	C	High-Speed Rail design criteria states (11.2.3 Electrical Clearances): "Electrical clearances from any live element of the OCS to any surrounding infrastructure shall be greater than 2 feet (600 millimeters) under all conditions." Electrical clearance of 2 feet cannot be achieved in the transit center and throat structure (see CHSRA DVR_0011) where 21'-6" TOR to BOS has been approved. Minimum System height is 18". Minimum CW height is 18'-9". That leaves a maximum possible electrical clearance of 1.25' (1'-3"). AREMA minimum passing clearance is 10.5"							05/25/22	CC
HSR.004	Chapter 18; General Comment - Train Control / Signaling	AC	04/22/22	Which signal principles is the DTX infrastructure being designed to - the Caltrain Route Signal rules, the Caltrain San Francisco Rules or the Speed Signal Rules (CTX)? A reference to this should be included within a suitable section of the DCM	05/18/22	MJS	DE	Caltrain San Francisco rules would govern, followed by Caltrain Route Signal rules. The governing signal principles will be included in the next revision of the DTX Design Criteria.				05/18/22	MJS	The next iteration of the DTX Design Criteria will include a reference to the governing signal principle.	05/25/22	CC
HSR.005	Chapter 18; General Comment - Train Control / Signaling	AC	04/22/22	There is no reference to any control center automation / traffic management functionality/equipment required as part of the DTX project - how will the live operational data on the DTX be relayed to the wider Caltrain/HSR network to enforce the timetable and manage perturbations?	05/18/22	MJS	C	DTX Train control systems will be connected to the Caltrain fiber backbone and routed to the Caltrain CCF/BCCF which serves as a node to HSR. Specific requirements of the signals communications interface between HSR and Caltrain are subject to PCEP final design.							05/25/22	CC
HSR.006	Chapter 18; General Comment - Train Control / Signaling	AC	04/22/22	It is not clear within the DCM whether it is the expectation that CBOSS PTC will be deployed on the DTX infrastructure by the contractor. This should be made clear.	05/18/22	MJS	A	See comment #Cal.002, 004. Section 18.7 has been revised to include the following: "The DTX PTC must be fully integrated with Caltrain's existing PTC system."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.007	Chapter 18; General Comment - Train Control / Signaling	AC	04/22/22	Has consideration been given to a broader harmonization of the train control system with the CHSRP project? There doesn't appear to be any explicit requirements within the DCM for incorporating HSR design requirements or constraints to allow HSR services to run on the DTX from a train control perspective.	05/19/22	MM	C	Integration of train control systems between CHSRA and Caltrain is being addressed at the State level. We are tracking the progress of this coordination between the operators via the project Issue Log. For the purposes of the current design and criteria, CHSRA has directed TJPA to use Caltrain's signaling system. The design criteria will be updated when further information is available on the systems requirements.							05/19/22	CC
HSR.008	Chapter 18, Rail Systems Scope	AC	04/22/22	The paragraph about bi-directional communications to the California High Speed Rail Control center should include reference to the sharing of operational data to ensure performance metrics (punctuality/timetable adherence) are met across the blended network - this will be required to facilitate delay attributions amongst owners/operators in the event of perturbation	05/18/22	MJS	A	Added the following sentence: "Operational data will be shared to ensure performance metrics such as punctuality and timetable adherence are met across the blended network to facilitate delay attributions amongst owners and operators in the event of service perturbation."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.009	Chapter 18, 18.6 Signals and Train Control - Traction Current Return	AC	04/22/22	The first 3 paragraphs do not relate to traction current return so should be removed from this section	05/18/22	MJS	A	Section 18.6 revised to following. 18.6 Signals and Train Control (includes first three paragraphs), 18.6.1 Traction Current Return, and 18.6.2 Tunnel Operations				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.010	Chapter 18, 18.6 Signals and Train Control - Traction Current Return	AC	04/22/22	Train detection equipment should be, where possible, immunized against traction return current at a LRU level - AC immune relays, filters etc., in addition to the provision of impedance bonds	05/18/22	MJS	A	Added the following sentence: "In addition to provisions for impedance bonds, train detection equipment must protect against incompatible traction return current such alternating current immune relays and filters."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.011	Section 14.2.2.2, 14-3	EAS	10/01/18	LEGACY Comment HSR18.002 - Should the Static Wire be termed "aerial" and not "optical"?	04/06/22	MJS	C	The optical static wire is multi-purpose, The fiber optic strands can be used for communication purposes while the 4/0 AWG ground wire in the center provides protection against lightning				05/18/22	MJS	Original comment assumed static and aerial optical where two distinct wires - Caltrain uses a multi-purpose optical static wire. Comment considered closed	05/18/22	CC
HSR.012	Section 14.2.2.1, 14-3	XB	10/01/18	LEGACY Comment HSR18.047 - 14.2.2.1 Traction Power Facility Data - At paralleling stations, a single 50/25 kV autotransformer shall be assumed, rated at 10 MVA, with 1.2% impedance - needs to be confirmed	04/06/22	MJS	C	Paralleling station parameters design assumptions have not changed thus far.							05/24/22	CC
HSR.013	Chapter 15, 15-1	MBr	10/01/18	LEGACY Comment HSR18.048 - Chapter 15 Scope - Shall also include bi-directional communications to CHSR OCC to relay all fault codes, health and diagnostic voice, video and text messages.	04/06/22	MJS	A	Revised Chapter 15 "Scope" as follows: "Correspondingly, the design of the DTX voice and train control system must be compatible and consistent with the Caltrain design and include bi-directional communications to California High-Speed Rail Authority operations control center (OCC) to relay all fault codes, health and diagnostic voice, video, and text messages."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 47
Comments Closed 47
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 18, Rail Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Steve Adkins (Design Team/Parsons)	SRA	E. Mortlock (Design Team/Parsons)	EM
Andrew Clapham (CHSRA)	AC	Philip Gilmour (CHSRA)	PG
X. Banko (CHSRA)	XB	M. Brunner (MBr)	MBr
Rusty Dudley (Caltrain)	RD	Uhila Makoni (Caltrain)	UM
Rick Bartholomew (Caltrain)	RB	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

AC – Action Code
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B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
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BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
Cal.001	Chapter 18	UM	04/29/22	Design should include Chapter 28 Communications Design Criteria from PCEP Design Criteria	05/18/22	MJS	A	Revised as noted				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.002	Chapter 18	UM	04/29/22	Remove all references to 'CBOSS' and keep PTC	05/18/22	MJS	A	Revised as noted				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.003	Chapter 18	UM	04/29/22	add Fiber Optic Association (FOA) to Codes and Standards section	05/18/22	MJS	A	Revised as noted				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.004	Chapter 18 Scope	RD	04/29/22	Caltrain doesn't have a CBOSS PTC system. Caltrain has an IETMS PTC system that is in operation.	05/18/22	MJS	A	Revised as noted				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.005	Chapter 18.4 ATCS Fiber Optic System	RD	04/29/22	Office to field communication uses the ATCS protocol for train control and DNP3 for traction power. Both are on the fiber optic network.	05/18/22	MJS	A	Moved to Ch. 19 Communications. (renamed SCADA system)				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.006	Chapter 18.4	UM	04/29/22	Rename ATCS Fiber Optic System section to SCADA System. Replace ATCS references with SCADA. ATCS is a radio protocol used for centralized train control. ATCS/CTC is not be synonymous with Caltrain Fiber Optic Backbone.	05/18/22	MJS	A	Revised as noted				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.007	Chapter 18.7	UM	04/29/22	Add reference to Positive Train Control system and integration of Caltrain's existing PTC.	05/18/22	MJS	A	Revised to add the following sentence: "The DTX PTC must be fully integrated with Caltrain's existing PTC system."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.008	Chapter 17	RB	10/18/18	LEGACY Comment Cal18.040 - Chapter 17, under "Scope" (second paragraph, fifth sentence - amend to read as follows) "Performance and safety of the train control system will be based on the Caltrain signal system."	04/06/22	MJS	A	Revised as noted.				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/18/22	CC
Cal.009	Chapter 17	RB	10/18/18	LEGACY Comment Cal18.041 - Chapter 17, under "Codes and Standards" (fifth bullet, highlighted text - "Parts 234") Part 234 applies to Grade Crossing	04/06/22	MJS	A	Reference to "Part 234" will be removed from the list of codes and standards				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/18/22	CC
TA.001	Section 18.1.2 Traction Power Load Flow Calculations (first para, last sentence)	LZ	07/04/22	States: "must determine whether PS-1 can provide sufficient traction power to the DTX project". When will that determination take place? what if it does not provide enough juice? Adding a paralleling station or substation is not in the scope or budget for the project. The analysis must be done ASAP,	09/13/22	MJS	C	The PMPC Team has coordinated closely with the TJPA, Design Team, Caltrain, and Caltrain's Traction Power consultant (Gannett Fleming) to develop the SOW for a Load Flow Assessment (LFA). The draft LFA SOW has been approved and TJPA has allocated funding to support the effort. The Design Team is preparing a NTP to be issued before October, 2022. The total timeline of the LFA effort is expected to take roughly 6-months. The 30% construction cost estimate includes an allowance for a paralleling station.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - After reviewing the cost estimate, there is an allowance for a paralleling station in the final PE cost estimate	10/11/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/11/22	CC
TA.002	Section 18.2.1.2, Environmental Conditions	LZ	07/04/22	System should be able to support speeds higher than the maximum authorized speed	09/13/22	MJS	A	Disagree, in terms of OCS design, the speed does not substantially impact design unless approaching speeds in excess of 60mph. The track alignment geometry and constraints within the tunnel would make an increase of more than 10mph unsafe. There are always safety factors applied to the design of an OCS system and there is no need for redundancy. Modified sentence to include "at least" accomodate MAS.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the PMPC response and revision.	10/11/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/11/22	CC
TA.003	Section 18.4, Signals and Train Control (Second para)	LZ	07/04/22	Replace "is implementing" with "has implemented"	09/13/22	MJS	A	revised as noted.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 23
Comments Closed 23
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 19, Communications*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Lindsay Yamane (Design Team)	LY	Rusty Dudley (Caltrain)	RD
Uhila Makoni (Caltrain)	UM	Andrew Clapham (CHSRA)	AC
James Deane (CHSRA)	JD	Paul Hebditch (CHSRA/HNTB)	PH
Luis Zurinaga (SF CTA)	LZ		
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Chap 19 - Scope	LY	08/03/22	(Bullet beginning "Caltrain Engineering Standards..") Should the "Caltrain Design Criteria" include "latest edition"?	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.002	Chap 19 - Scope	LY	08/03/22	(Bullet beginning "Peninsula Corridor Electrification Program..) Should the PCEP design Criteria be referred to by "issue date"? It will be revised by Caltrain and likely updated/issued in early 2023.	09/13/22	MJS	A	The intro sentence to the list states that the "latest version" of the listed criteria and guidance should be used. So I think that should take care of it.				10/19/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/19/22	CC
GEC.003	19.4 Closed Circuit Television	LY	08/03/22	(Bullet beginning "Points of access to restricted areas..) There is no section 20.1.2.2 - please add or correct subsection reference	09/13/22	MJS	A	Revised reference to Section 14.5, Ventilation and Emergency Egress Structures				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.004	19.4 Closed Circuit Television	LY	08/03/22	(Add bullets after "Elevator Cabs") *Ticket vending machines and other patron fare collection systems * Blue Light Stations and cross-passageway doors	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.005	19.5 Variable Message Signs	LY	08/03/22	Editorial: Title includes a number one (1) in "1Variable Message Signs"	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.006	19.8 Intrsion Detection/Access Control	LY	08/03/22	(First Para, last sentence) Should "Caltrain PCEP Design Criteria inlcude the "Caltrain Design Criteria (August 1, 2020, or latest edition)" as this will describe ID/AC requirements throughout system.	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.007	19.9 Supervisory Control and Data Acquistion	LY	08/03/22	(Add bullet after "Blue Light Stations..") * Cross-passage doorways in partitioned tunnel section	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.001	Chapter 19	UM	04/29/22	Scope should cover existing Caltrain facilities that will serve as primary head end for communication systems and SCADA i.e. Menlo Park Control Center, San Jose Control Center, San Carlos Office	05/17/22	MJS	A	Agreed - reference added to primary head end as noted.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.002	Chapter 19	UM	04/29/22	Fiber Optic Communications Backbone needs a design criteria to integrate Caltrain's existing drawings, standards, and specifications.	05/17/22	MJS	DE	Further coordination and data sharing is needed between Caltrain, PMPC, and design team - once an agreement is established, criteria will be added				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.003	Chapter 19	UM	04/29/22	add Fiber Optic Association (FOA) to Codes and Standards section	05/17/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.004	Chapter 19	UM	04/29/22	Add subsystem PTC, Wi-Fi, data radios i.e. 220 MHz	05/17/22	MJS	DE	Further coordination and data sharing is needed between Caltrain, PMPC, and design team - once an agreement is established, criteria will be added				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.005	Chapter 19.1 Communications Network System	RD	04/29/22	Caltrain doesn't have a CBOSS PTC system. Caltrain has an IETMS PTC system that is in operation. The PTC, signaling and traction power systems are separate systems but all both use the fiber optic network.	05/17/22	MM	A	The criteria was updated based on the PCEP design criteria which referenced the CBOSS system. Will update to reference IETMS.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.006	Chapter 19.1	UM	04/29/22	Rename Communications Network System to Operations Technology (OT) Network.	05/17/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.007	Chapter 19.1	UM	04/29/22	Remove all references to 'CBOSS' and keep PTC	05/17/22	MM	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.008	Chapter 19.1	UM	04/29/22	DTX OT Network design shall eliminate network delays and/or outages as a result of network spanning tree convergence.	05/17/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.009	Chapter 19.9 Supervisory Control and Data Acquisition System	RD	04/29/22	What is meant by the SCADA system? At Caltrain, the SCADA system is the back office system that interfaces with the traction power system. The same back office system also interfaces with the signaling and PTC systems. In addition to the PCEP design criteria, the DTX extension must also meet the requirements of the signaling and PTC design criteria.	05/17/22	MM	C	SCADA in the stations and tunnels will allow for essential fire/life/safety systems to be coordinated with the train control systems. TJPA is working closely with Caltrain on the systems related submittals to ensure Caltrain's needs are met. If a criteria becomes available, it will be included in the next issue of the design criteria. Will carry over to risk register.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.010	Chapter 19.10	UM	04/29/22	Add Clipper system to Automated Fare Collection System	05/17/22	MJS	A	Revised to read as follows: "Ticket vending machines for the Fourth and Townsend Street Station and transit center must be furnished, tested, and commissioned by Caltrain, be compatible with the Clipper system, and must conform to the Caltrain's PCEP design criteria. "				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.001	Chapter 19, Communications Scope	AC	04/22/22	No reference to the requirements for communications links between the Salesforce Transit Center and CEMOF/Menlo Park for operational communications in the event of certain failure events, this would be required in the event of fallback operations	5/17/2022	MM	C	Caltrain is still assessing their needs with regards to the emergency mimic train control facility. TJPA is working closely with Caltrain on the systems related submittals to ensure Caltrain's needs are met. If a criteria becomes available, it will be included in the next issue of the design criteria.				05/17/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.002	Section 16.10, 16-8	PH	10/01/16	LEGACY Comment HSR18.016 - Fare collection issues should also be discussed with CHSR as they will operate at 4th and Townsend	04/06/22	MJS	C	The Fourth and Townsend Street Station technical working group (comprised of IPMT, PMPC, and GEC) is responsible for coordinating the design of the underground station aspects: Programmatic space requirements, emergency egress/Point of safety, vertical conveyance, architectural, structural, and operational.				05/17/22	MJS	Fare collection is primarily a Caltrain issue at Fourth and Townsend Street Station - on-going coordination regarding programmatic space requirements and paid areas will ultimately dictate design requirements which will be captured in the DTX Design Criteria once solidified.	05/17/22	CC
HSR.003	Chapter 16 (General)	JD	10/01/16	LEGACY Comment HSR18.076 - Reference CHSRA design requirements and coordinate relevant standards	04/06/22	MJS	A	CHSRA design criteria manual added to the list of references under "Codes and Standards" for Chapter 16.				05/17/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
TA.001	Section 19.3, Public Address and Talking Sign	LZ	07/04/22	Has consideration been given to include PAS in the tunnels to inform/direct passengers in the event of an emergency?	09/13/22	MM	C	At this time, WiFi will be used to communicate with the public in the tunnel as well as the train-based PAS system.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA is concerned about passengers exiting trains and heading to an exit that may not be viable - recognize that this is not a standard/requirement and the condition is unlikely.	10/11/22	MJS	The responder (PMPC Team) has agreed to discuss this topic and how to mitigate the potentiality during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/11/22	CC
TA.002	Section 19.5, Variable Message Signs	LZ	07/04/22	Remove "1" from title	09/13/22	MJS	A	Editorial: Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.003	Section 19.10, Automated Fare Collection System	LZ	07/04/22	Fare collection is not part of the communication system	09/13/22	MJS	B	Disagree, Fare collection machines will require fiber optic/ethernet connection to a local area network (LAN) infrastructure for monitoring and control among other communication needs.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with PMPC response.	10/11/22	MJS	The responder (PMPC Team) clarified the orginal commentor's inquirty, no change required - comment is considered closed.	10/11/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 9
Comments Closed 9
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 20, Corrosion Control*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Eric A. Scotson (CHSRA)	EAS	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.001	Section 19.4, 19-2	EAS	10/01/18	LEGACY Comment HSR18.003 - 1st. Bullet - The DTX electrification is via an AC System not DC as such there are no positive or negative traction power distribution circuits. If the reference is meant to be to the Negative Feeder (a common term for a 2 x 25kV System) with the OCS being the "positive" circuit - both are energized at 25kV to ground and therefore there cannot be any direct connections to ground.	04/06/22	MJS	A	Revised as noted: "Operate and maintain the DTX system with no direct or indirect electrical connections to dc traction power distribution circuits of adjacent transit systems."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.002	Section 19.4, 19-2	EAS	10/01/18	LEGACY Comment HSR18.004 - Last Paragraph: clarify that ……. DTX structures shall be protected from direct contact with "DC System" anchors and foundations etc.	04/06/22	MJS	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.003	Section 19.4.1, 19-2	EAS	10/01/18	LEGACY Comment HSR18.005 - Strongly recommend that minimum size be specified for rebar used as a part of the grounding system.	04/06/22	MJS	A	This section addresses requirements for reinforcement bonding only where required for stray current mitigation from other transit systems/dc sources. This section does not address reinforcement sizing or grounding and bonding requirements for AC safety.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.004	Section 19.4.1, 19-2	EAS	10/01/18	LEGACY Comment HSR18.006 - Strongly recommend that a minimum size requirement is included for copper conductors used as continuity bonds.	04/06/22	MJS	DE	This section addresses requirements for reinforcement bonding only where required for stray current mitigation from other transit systems/dc sources. Added a minimum bond cable size of AWG #1/0 stranded copper cable.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.005	Section 19.5.4, 19-4	EAS	10/01/18	LEGACY Comment HSR18.007 - Strongly recommend that a minimum size requirement is included for copper conductors used as continuity bonds.	04/06/22	MJS	A	This section addresses continuity bonding of mechanically joined pipelines for stray current mitigation only. Added a minimum continuity bond cable size of AWG #6 stranded copper cable.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
TA.001	Section 20.1.2, Survey (First para)	LZ	07/04/22	Insert "existing corrosion control measures in" between" identify" and "utilities"	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.002	Section 20.5.5, Cathodic Protection (Third para)	LZ	07/04/22	Why just tanks owned by the TJPA vs tanks in the project?	09/14/22	MM	A	Will remove "owned by TJPA".				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.003	Section 20.5.6, Test Facilities	LZ	07/04/22	Bc specific. Test facilities for what purpose?	09/13/22	MJS	A	Revised as follows: "The requirements for test facilities for soil and water corrosion control must be included as part of the design."	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with PMPC response.	10/11/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/11/22	CC
TA.004	Section 20.5.7, Casings (First para)	LZ	07/04/22	Add "or manufacturer" after Owner	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

REV. 02 Chapter #	REV. 01 Chapter #2	Chapter Title	Batch #	# of Pages	Date Received	Primary Responsibility	STATUS	Total Comments	Closed Comments	Remaining	% Complete
Chapter 01	*Chapter 01*	Overview	1	8	12/2/2021	Kaku	Editorial	51	51	0	100%
Chapter 02	*Chapter 02*	Owners Requirements	4	6	5/5/2022	Schreffler	Editorial	86	86	0	100%
Chapter 03	*Chapter 03*	Safety and Security	1	3	12/2/2021	Schreffler	Editorial	7	7	0	100%
Chapter 04	*Chapter 04*	Environmental Requirements	1	5	12/2/2021	Schreffler	Editorial	9	9	0	100%
Chapter 05	*Chapter 05*	Civil Design	1	9	12/2/2021	Spargur	Editorial	32	32	0	100%
Chapter 06	*Chapter 06*	Utilities	2	5	3/25/2022	Spargur	Editorial	6	6	0	100%
Chapter 07	*Chapter 07*	Guideway Geometrics	2	15	3/25/2022	Schreffler	Editorial	123	123	0	100%
Chapter 08	*Chapter 08*	Trackwork	2	5	3/25/2022	Schreffler	Editorial	109	109	0	100%
Chapter 09	*Chapter 09*	Geotechnical Requirements	2	13	3/25/2022	Kaku	Editorial	104	104	0	100%
Chapter 10	*Chapter 13*	Seismic Design	3	13	4/15/2022	Kaku	Editorial	70	70	0	100%
Chapter 11	*Chapter 10*	Protection of Existing Inf	2	8	3/25/2022	Kaku	Editorial	50	50	0	100%
Chapter 12	*Chapter 11*	Structures	2	22	3/25/2022	Kaku	SME Response	123	123	0	100%
Chapter 13	*Chapter 12*	Tunnels	3	19	4/15/2022	Schreffler	Editorial	99	99	0	100%
Chapter 14	*Chapter 20 & 21*	Architecture	3	27	4/15/2022	Kaku	Editorial	131	131	0	100%
Chapter 15	*Chapter 22*	Fire-Life Safety	3	10	4/15/2022	Kaku	Editorial	41	41	0	100%
Chapter 16	*Chapter 23*	Mechanical Systems	4	35	5/5/2022	Kaku	Editorial	50	50	0	100%
Chapter 17	*Chapter 24*	Electrical Systems	4	21	5/5/2022	Schreffler	Editorial	14	14	0	100%
Chapter 18	*Chapter 14, 15, 17*	Rail Systems	4	8	5/5/2022	Schreffler		47	47	0	100%
Chapter 19	*Chapter 16*	Communications	4	5	5/5/2022	Schreffler	Editorial	23	23	0	100%
Chapter 20	*Chapter 19*	Corrosion Control	4	9	5/5/2022	Kaku	Editorial	9	9	0	100%
				246				**1184**	**1184**	**0**	**100%**

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Transbay Program
Phase 2
Review Comment Sheet

Total Comments	**24**
Comments Closed	**24**
% Complete	**100%**

Document Control File Code:

Project:	*Transbay Program*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Downtown Rail Extension (DTX)*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria Revision Book 02 - ACTION ITEMS TO CARRY FORWARD*		
Document date:	*10/21/2022*		

Reviewers			
Name	Initials	Name	Initials
John Bumanis (Design Team/Parsons)	JB	Phillip Gilmour (CHSRA)	PGi
Pete Gutierrez (Caltrain)	PCG	Heather Kim (Design Team/PCPA)	HK
Douglas McLoud (CHSRA)	DMcL	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Nader Shahcheraghi (PMPC SME/ AECOM)	NS		

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A – Responder agrees and will comply
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Review Team						PMPC Team				Review Team			PMPC Team			Review Team	
Rev Book 02 Chapter	**No.**	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
04, Environmental Requirements	Cal.001	Chapter 4 Section 4.2; (Page 4-2 of 4)	PCG	06/17/22	Environmental Requirements: Be beneficial to have projected ambient temperatures within the tunnel and covered section of the track system - Helpful in determining the desired rail neutral temperature	09/01/22	MJS	C	The ambient temperature and humidity ranges for the tunnel will be determined through analysis/design work and will depend primarily upon the air flow modeling and ambient air exchange and mechanical damper system. It is not our intent to include this as a design criteria.				10/06/22	MJS	The responder (PMPC Team) has agreed to provide ambient/design temperature and humidity ranges within the tunnel and underground structures during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/06/22	CC
07, Guideway Geometrics	Cal.034	Chapter 7, Section 7.3.5.1; (Page 7-14 of 15)	BZ	06/30/22	Table 7-8 - Change tolerances to +- 0.125 for Ballasted and Direct Fixation track. Refer to Caltrain Specs 20400 for track constuction tolerance.	09/01/22	MJS	C	Caltrain track construction tolerance requirement for ballasted track is 0.5" (vertical and horizontal). The DTX Design Criteria may need to be updated once Caltrain publishes updated Caltrain Standard Specifications (end of 2020)				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC
07, Guideway Geometrics	HSR.005	subheading 7.2.7.2	DMcL	03/16/22	Where have the all the values for superelevation in Table 7-3 been taken from as there is no mention of these in the Caltrain Design Criteria, Chapter 2 - Track AFFECTS: Caltrain	05/10/22	MJS	DE	DTX Design Criteria REV 01, released in 2009 and reviewed by the Operators in 2016/2018 included Table 7-3 - Maximum Superelevation. Absolute maximum values for actual (5 in) and unbalanced superelevation (3 in) are stated in the Caltrain Design Criteria, Chapter 2 - Track, Part C - Track, subsections 4.0-4.2. Desirable values for actual (currently 4 in) and unbalanced superelevation (currently 3 in) were updated based on Caltrain comments. The "Maximum negative unbalance for slowest operating speed on curve" line has been removed and a sentence added after the table noting that negative unbalance will be avoided.	06/27/22	BCC	In October 2018 a Basis of Design Memo was approved by Caltrain and CAHSR which amended the Caltrain Design Criteria in Sections 1, 4 1nd 5.2. These amendments should be used between San Francisco to South of CP Lick. I would have thought these should also form part of the DTX Project as it is on the Caltrain ROW. If these were not issued it will need confirmation that these have not to be used and highlighted accordingly (I do note that the maximum superelevation in the 2020 version of the Caltrain Design Criteria is quoted as 5 inches)	10/07/22	MJS	The responder (PMPC Team) has reviewed the backcheck comment provided by CHSRA and reviewed the 2018 Basis of Design Memo. Given the proposed MAS for the project limits and lack of agreement between TJPA regarding applicability to the DTX project, this comment will remain unchanged for this version of the DTX Design Criteria (living project document). The PMPC Team agrees to carry forward this concept/conflict for further discussion and resolution in the next phase of design.	10/07/22	CC
07, Guideway Geometrics	HSR.027	Chapter 7 General	DMcL	03/16/22	There is no mention of a continuous check rail (restraining rails) for the tight radius curve of 650 feet radius. From a study I have read it would seem that in the US they are using 500 feet and below, however there are times when greater than 500 feet they have been used. As we do not know what trainset CAHSR will be adopting I feel that an allowance should be made for the use of these. AFFECTS: CHSRA	05/18/22	MM	C	Guard rail criteria can be found in Chapter 8. The current design includes guard rails on the 650 ft radius curves.	06/27/22	BCC	In this comment I am discussing continuous check rails (restraining rails) which are in place to stop derailments on tight radius curve. As the 650 feet radius is on the approach to station platforms it may be worthwhile consdering having these in place	09/01/22	MJS	The responder (PMPC Team) agrees to investigate including tight curve restraining rail requirements in the next version of the DTX Design Criteria (living project document). Restraining rails have been added to the PE design on tight radius curves.	10/07/22	CC
07, Guideway Geometrics	HSR.032	CAHSR/PG/003	PGi	07/03/22	Table 7-10 - the listed minimum horizontal clearance for CAHSR is 9ft3in this is incorrect. Please advise where this figure was derived.	05/10/22	MJS	A	Revised to 8 ft 7 in.	06/22/22	BCC	The DCM has been revised to show a horizontal offset from track CL to tunnel wall as 8ft 7in, this is still incorrect. The minimum horizontal clearance for CHSR is 10ft 8in. This figure has been listed incorrectly on 2 occasions and I would ask where these figures are being derived.	10/12/22	MJS	The values provided in the DTX criteria for minimum horizontal clearances are derived from CPUC GO 26-D, Section 9, which states the following: "9.2 Minimum side clearances of railroad and street railroad tracks which are not used or proposed to be used for transporting freight cars shall be thirty (30) inches from the side of the widest equipment operated, except that for poles support trolley contact conductors between main line double tracks such distance may be decreased to twenty-four (24) inches." The last DTX Design Criteria (May 2009) listed this value for CHSRA as 8'-3". CAHSR FJ Blended criteria stated 9'-3". The CHSRA vehicle dynamic envelope (VDE) is the controlling clearance envelope of the DTX project. The maximum horizontal data point provided by CHSRA was 6.055 feet (assume 6'-1"). Adding 30" from CPUC results in 8'-7". Requiring 10'-0" clearance (an additional 25") of horizontal clearance on each side of all tracks would impact project cost by orders of magnitude. The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
07, Guideway Geometrics	HSR.033	CAHSR/PG/004	PGi	07/03/22	Table 7-10 - Lines 1 and 2 of this table state the same information, please advise if these should differ.	05/10/22	MJS	C	First line is below-grade, second line is at-grade	06/22/22	BCC	Agree with comment responses however listed horizontal clearance for CHSR is incorrect. States 9ft 3in this should read 10ft 8in.	10/12/22	MJS	The PMPC Team has reviewed CHSRA Design Criteria (Rev 5) Chapter 23 - Trackway Clearances. Section 23.2.1.2.1 Minimum Horizontal Clearances from High-Speed Rail Track Centerline. The 10'-8" dimension is to centerline of OCS poles (not face) so this dimension is not needed. The argument will be on the "Face of fixed equipment" being 10 feet (0 inches) clearance. Further coordination and agreement(s) between TJPA, CHSRA, and Caltrain are needed to resolve minimum horizontal clearance. Requiring 10' horizontal clearance to elements within the DTX tunnel would result in excessive and unnecessary cost given the low MAS (30mph max. within tunnel). The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
07, Guideway Geometrics	HSR.034	CAHSR/PG/005	PGi	07/03/22	Table 7-11 - clearance to tunnel crown is listed as 24ft6in desirable, 21ft6in absolute. These values do not align with the working values for CAHSR, please advise where these values were derived. CAHSR mandated values are 27ft desirable, 24ft6in absolute.	05/13/22	MM	C	Please see approved DVR 0011 allowable clearance = 21'-6".	06/22/22	BCC	Disagree with the response. CHSR DVR0011 deals with the along track positioning of OCS structures and not tunnel heights. Please can the consultant forward the supporting document they refer to. Additionally, approval of any previous DVR does not mean that those criteria can be applied wholesale across the infrastructure. The CHSR values are as stated in my original comment and must be complied with.	10/12/22	MJS	Refer to Transbay Transit Center FRA Sign-off documents prepared by PCPA and approved by TJPA and CHSRA in 2013. This document (separate from the previously referenced DVR0011) justifies the minimum vertical clearance of 21'-6". The responder (PMPC Team) recognizes the point made in the backcheck response from the commentor about the applicability of an approved design variance request (DVR 0011) - The FRA sign-off document, approved by CHSRA does set a precendence for low-speed tunnel conditions. The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
08, Trackwork	HSR.002	8.1.1	DMcL	03/22/22	The track gauge will be 4 feet 8.5 inches, not just on tangent track except on tight radius curves where gauge widening may be required.	05/12/22	MJS	A	Revised to read as follows: "Track gauge will be 4 feet 8.5 inches, measured at 0.625 inches below the head of the rail on the gauge side on all tracks except on tight radius curves where gauge widening may be required."	06/27/22	ROK	Accepted with amendments. At what radius will gauge widening be required. Does the project have radii that fit the criteria, if so gage widening criteria needs to be shown	10/7/2022	MJS	The responder (PMPC Team) agrees to coordinate with operators and define threshhold for gauge widening and requirements will be addessed at the next stage of design. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/7/2022	CC

Transbay Program
Phase 2
Review Comment Sheet

Total Comments 24
Comments Closed 24
% Complete 100%

Document Control File Code:

Project:	*Transbay Program*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Downtown Rail Extension (DTX)*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria Revision Book 02 - ACTION ITEMS TO CARRY FORWARD*		
Document date:	*10/21/2022*		

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Pete Gutierrez (Caltrain)	PCG	Heather Kim (Design Team/PCPA)	HK
Douglas McLoud (CHSRA)	DMcL	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
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Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Nader Shahcheraghi (PMPC SME/ AECOM)	NS		

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Review Team						PMPC Team				Review Team			PMPC Team			Review Team	
Rev Book 02 Chapter	**No.**	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
11, Protection of Existing Infrastructure	HSR.001	Chapter 11 - Scope	FW	03/28/22	"This chapter seems to focus on existing structure protection during construction ""resulting from excavation associated with the construction"". Should the scope also address the post-construction seismic resistance/response (i.e.: no added harm due to the new construction) of the existing structures ? Section 10.2 discusses additional loads imposed upon existing foundations with respect to excavation related ground movements, and mitigations (underpinning, protective works), but not post-construction existing structure seismic response. Is the assumption that the post-construction existing structure seismic resistance/response the same as the current pre-construction state ?"	05/25/22	MJS/DP	B	No, the suggested scope to address post-construction seismic resistance/response of existing structures is not considered within the scope of the DTX Design Criteria.	06/23/22	BCC	Understood, not within scope of DTX Design Criteria. However, to avoid future disputes, recommend TJPA consider existing structure be subject to "no added harm due to new construction" per the original comment.	10/06/22	MJW	The commentor (CHSRA) agreed that the topic is not within the scope of the DTX Design Criteria. The responder (PMPC Team) has agreed to investigate the proposed clause during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/06/22	CC
12, Structures	TA.002	Section 12.1.8, Waterproofing	LZ	07/04/22	Waterproofing design has to address potential leakage resulting from improper membrane installation	09/02/22	NLV	B	Improper constuction and installation repairs will be addressed in Specifications and Technical Requirements.	10/05/22	LZ	Based on experience, waterproofing is never perfect regardless of effort.	10/05/22	MJS	The responder (PMPC Team) has agreed to develop requirements for waterproofing system and failure repair procedures. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
12, Structures	TA.004	Section 12.1.8, Waterproofing (Second para)	LZ	07/04/22	States: "Where reinforced concrete is to be placed against the waterproofing membrane, no damage to the exposed membrane surface that would permit seepage through the membrane is allowed". This is the achilles heel of membrane waterproofing. Damage that is not easily detected and can esily occur, specially during rebar installation. If membrane waterproofing is to be used, there needs to be a requirement that very strict QA/QC procedures must be developed and monitored.	09/02/22	NLV	B	Improper constuction and installation repairs will be addressed in Specifications and Technical Requirements.	10/05/22	LZ	During CRM with SF CTA on 10/5, it was agreed that stringent quality requirements for the waterproofing system will be covered under technical specifications during the next phase of design.	10/05/22	MJS	The responder (PMPC Team) has agreed to develop requirements for waterproofing system and failure repair procedures. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
12, Structures	TA.012	Section 12.2.2.5, Joints (B. Construction Joints) (fifth sentence)	LZ	07/04/22	There are many types of waterstops, some more effective than others. Which types are recommended?	09/02/22	NLV	B	Waterstop requirements or definition are better suited to a Technical Requirements or Specifications document. Suggest to leave off Design Criteria, but include in Technical Requirements or Specifications.	10/05/22	LZ	During CRM with SF CTA on 10/5 - It was agreed that the waterstop type will be defined during the next phase of design in a technical specification/requirement.	10/05/22	MJS	The responder (PMPC Team) has agreed to define waterstop type and to develop requirements and specifications for waterstops. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
13, Tunnels	Cal.015	Chapter 13 Section 13.5.4; (Page 13-14 of 20)	JP	06/30/22	Load sharing between the temporary construction support and the final lining of the mined tunnel shall be justified by analysis and approved by TJPA prior to NTP for final design. (reference MINED Tunnel Design Preliminary Engineering Technical Memorandum 334.1.1)	08/19/22	DP	C	Please refer to comment GEC.010 above, and the resolution with the GEC. There is no way the integrity of the initial support can be verified after the maximum seismic event.				10/04/22	MJS	See response to comment GEC.010 above. We met with the GEC to discuss load sharing, with the intent of determining how we can verify the integrity of the initial support after a maximum seismic event, which it is not designed to withstand, and trying to understand the cost implications of the criteria. Per that comment we may revisit this issue later. As stated, this could also be proposed as a VE savings though that too would need to address post-seismic event support integrity. The responder (PMPC Team) has agreed to investigate load sharing concepts during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
13, Tunnels	HSR.007	Section 13.2.3. p. 5	SK	03/28/22	Shouldn't design ground loads be given in the Geotechnical Baseline Report (GBR). There should be an interpretive geotechnical report that defines the ground loads and groundwater pressures for design.	05/03/22	DP	C	Ground loads will not be provided in the GBR. For a DB or other alternative procurement, these will be developed by the Geotechnical Engineer of Record. Parameters used as part of the Preliminary Engineering can be provided as a reference document.	06/21/22	BCC	Do not agree that it should be up to Geotechnical Engineer of Record to determine design ground loads. The Owner has a vested interest in making sure that lining is designed properly. GBR should indicate minimum design ground loads that must be complied with.	08/19/22	DP	There are many examples of GBR's without minimum design ground loads - LA Metro Measure R Projects, Sound Transit East Link, Northgate Link, U-Link, BART Silicon Valley Extension just to name a few. With the exceptioon of BSVII, these projects have been constructed, with proper lining design. There is significant opportunity for design parameters developed by the Geotechnical EOR to be reviewed for their appropriatenessss. The responder (PMPC Team) will investigate the merits of including minimum design ground loads as a requirement for the GBR during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
13, Tunnels	HSR.018	13.5.4, p. 13	SK	03/30/22	Neglecting load sharing for a SEM tunnel is very conservative. Typically for a tunnel this size, the thickness of the initial support shotcrete will be significant and some of it should be effective for long-term ground support. This requirement should be re-evaluated.	05/03/22	DP	C	The previous version of the DTX Criteria did allow load sharing between the initial support and final lining. Ultimately omitting the load share component is not that conservative. The initial support is penetrated regularly by spiles and other temporary steelwork. It is not designed for the ODE or MDE events. Ensuring it's durability for the 100 year project design life or its integrity after an ODE/MDE event is questionable. The quality of initial lining shotcrete installation would also need to improve significantly prior to accepting this condition - which would necessitate more rigorous quality assurance and control during construction, at a cost premium. Load sharing was not permitted for Chinatown Station, nor for the Regional Connector Cavern, nor for the Sound Transit Bellevue Tunnel. Caltrans Devils Slide tunnels assume deterioration of the initial support and that all loads be supported by the final lining. At this scale the arch final lining is typically thicker than would be required for strength design alone, to accommodate placement of concrete. The cost implications from ignoring a contribution of the initial support are not that great.	06/21/22	BCC	It seems like load sharing with the intial support system could be utilized to safely achieve some cost savings. It is noted that the final lining is 18 to 21 inches thick and reinforced with steel rebar mats on each face. This lining thickness is more than enough for constructability. The initial shotcrete layers may be subject to long-term degradation but subsequent layers would be protected and would not be penetrated by spiling or other rock reinforcement. This is something that may be of interest from a value engineering standpoint.	08/19/22	DP	See response to comment GEC.010 above. We met with the GEC to discuss load sharing, with the intent of determining how we can verify the integrity of the initial support after a maximum seismic event, which it is not designed to withstand, and trying to understand the cost implications of the criteria. Per that comment we may revisit this issue later. As stated, this could also be proposed as a VE savings though that too would need to address post-seismic event support integrity. The responder (PMPC Team) has agreed to investigate load sharing concepts during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
14, Architecture	GEC.041	Section 14.1.3.3, Platforms (Passenger Benches)	HK	08/03/22	The criteria notes that "Passenger benches" at the platform level must be included. However, there is no mention of benches at the Lower Concourse where it will provide waiting/seating areas for rail passengers at Salesforce Transit Center. Also, benches at the platform level should be confirmed with the operator since CHSRA was previously planning to keep passengers on the lower concourse before calling passengers to board and head down to the platform level. In addition, the platform widths and obstructions limit clearances at platform level, therefore, placement of benches will be restrictive.	09/22/22	OA	DE	Comment requires clarification - TJPA will need to define % of projected ridership (Currently unavailable or inaccurate - same for lower concourse)				10/07/22	MJS	The responder (PMPC Team) added a new bullet "passenger benches" to section 14.1.3.3 concourse and lower concourse comment; therefore this comment is considered closed. The responder (PMPC Team) recognizes that the quantity and location of benches will need to be defined once updated ridership numbers are provided by the operators during the next phase of design.	10/10/22	CC

Transbay Program
Phase 2
Review Comment Sheet

Total Comments	**24**
Comments Closed	**24**
% Complete	**100%**

Document Control File Code:

Project:	*Transbay Program*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Downtown Rail Extension (DTX)*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria Revision Book 02 - ACTION ITEMS TO CARRY FORWARD*		
Document date:	*10/21/2022*		

Reviewers			
Name	Initials	Name	Initials
John Bumanis (Design Team/Parsons)	JB	Phillip Gilmour (CHSRA)	PGi
Pete Gutierrez (Caltrain)	PCG	Heather Kim (Design Team/PCPA)	HK
Douglas McLoud (CHSRA)	DMcL	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Nader Shahcheraghi (PMPC SME/ AECOM)	NS		

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team						PMPC Team				Review Team			PMPC Team			Review Team	
Rev Book 02 Chapter	**No.**	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
15, Fire-Life Safety	GEC.001	15.1 - Design Fire Size	JB	04/08/22	Consider keeping the table that is currently provided in the 2009 edition of the criteria. This Table presents information (e.g. MW for trash) that isn't in the RVA criteria. The train fire heat release rate and growth rate are also consistent with the current SES/CFD work being performed.	05/17/22	NS	A	Added the table back into section 15.1.	08/05/22	BCC	The train fire heat release rate and growth rate (and current SES/CFD modeling work) requires further discussion	10/06/22	MJS	Noted. Design Criteria can be updated after further discussion considering SES and CFD analysis modeling. CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
15, Fire-Life Safety	GEC.012	15.1	JB	06/23/22	This section requires that the design train fire size and growth rate conform to the fire sizes indicated in the Transbay Program's Final Risk and Vulnerability Assessment. This may not be feasible with the current system. In addition, the fire heat release rates mandated by RVA criteria are higher than what is being used for the current SES/CFD task.	09/20/22	NS	B	See response to item GEC.001 Fire size and growth rate should be based on the design rolling stock and can not be determined arbitrarily based on what is feasible for the current system. The system should be designed to meet the design criteria, not the other way around.	10/06/22	ROK	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed treat this comment in same fashion as GEC.001.	10/06/22	MJS	Noted. Design Criteria can be updated after further discussion considering SES and CFD analysis modeling. CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
15, Fire-Life Safety	TA.003	Section 15.2.1, Ventilation System Monitoring and Control	LZ	07/04/22	This section implies that there will be work at the Caltrain CCF by/for the DTX. Is this in the DTX scope/budget?	09/20/22	MJS	C	The interfacing capabilities of Caltrain are not currently captured explicitly in the scope/budget of the DTX project but are accounted for in contingencies. The precise interface requirements and scope will need to be determined and agreed upon between TJPA and the operators during the next phase of design.				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation on original comment and will agree to carry this concept onto the next phase of design for interface management; therefore this comment is considered closed.	10/07/22	CC
16, Mechanical Systems	GEC.001	16.1.1	JB	04/21/22	1) Section 16.1.5.2 discusses by-pass dampers but does so in the context of temperature control and only if necessary (i.e. "Where necessary during normal operations, bypass shafts must allow air exchange between the outside ambient and the tunnel."). Since both stations will be mechanically ventilated during normal operations, additional by-pass dampers and shafts do not appear to be required to ensure air exchange between the outdoors and the stations. Please verify. 2) Also, there is no requirement in this paragraph or criteria chapter regarding the need for any blast or piston action relief shafts. Please verify that piston action relief is not necessary.	05/17/22	NS	DE	In addition to temperature control, relief shafts may be required to control pressure transients due to portal entry/exit or sudden expansion/contraction of tunnel cross sectional area. Alos, piston effect could cause excessive velocity in stations if piston effect is relieved only through the stations. So the designer should evaluate, using engineering analysis, the need for relief shafts based on these requirements, in addition to temperature control.	08/05/22	BCC	Doesn't address issue associated with requirement for air exchange through by-pass dampers.	10/06/22	MJS	What requirements for air exchange through by-pass dampers, other than those for temperature control and pressure transient control? Please elaborate. **CRM held with John B., Nader S., and Matt S. on 10/6/22** - Currently there is no bypass provisions at the DTX stations. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
16, Mechanical Systems	GEC.004	16.1.4.3	JB	04/21/22	This section requires that the design train fire size and growth rate conform to the fire sizes indicated in the Transbay Program's Final Risk and Vulnerability Assessment. This may not be feasible with the current system. In addition, the fire heat release rates mandated by RVA criteria are higher than what is being used for the current SES/CFD task.	05/16/22	AK	A	The Final Risk and Vulnerability Assessment is being rebranded as the Threat and Vulnerability Assessment (TVA) and is currently in the process of being updated. The design train fire size and growth rate will be verified after the assessment is complete.	08/05/22	BCC	This topic requires further discussion	10/06/22	MJS	**CRM held with John B., Nader S., and Matt S. on 10/6/22** - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic and ensure consistency across all project documents (DTX DCM, TVA, designs, and models) as an action item during the next phase of design.	10/06/22	CC
16, Mechanical Systems	GEC.015	16.1.6.2	JB	06/23/22	1) Section 16.1.6.2 discusses by-pass dampers but does so in the context of temperature control and only if necessary (i.e. "Where necessary during normal operations, bypass shafts must allow air exchange between the outside ambient and the tunnel."). Since both stations will be mechanically ventilated during normal operations, additional by pass dampers and shafts do not appear to be required to ensure air exchange between the outdoors and the stations. Please verify. 2) Also, there is no requirement in this paragraph or criteria chapter regarding the need for any blast or piston action relief shafts. Please verify that piston action relief is not necessary.	09/20/22	NS	C	Piston action relief is necessary. Please see PMPC response dated 05/17/22 to item GEC.001				10/06/22	MJS	What requirements for air exchange through by-pass dampers, other than those for temperature control and pressure transient control? Please elaborate. **CRM held with John B., Nader S., and Matt S. on 10/6/22** - Currently there is no bypass provisions at the DTX stations. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
17, Electrical Systems	TA.001	Section 17.2.2.1, Emergency Generators	LZ	07/04/22	States: "Generators must be located at street level where possible" Generator in the train box extension is below ground. Even though above ground is possible, it is undesirable. Need to add section for below ground generators	09/14/22	RW	DE	Subsurface generator requirements will be provided during next phase of design				10/04/22	MJS	The responder (PMPC Team) has agreed to incorporate subsurface generator requirements during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
19, Communications	TA.001	Section 19.3, Public Address and Talking Sign	LZ	07/04/22	Has consideration been given to include PAS in the tunnels to inform/direct passengers in the event of an emergency?	09/13/22	MM	C	At this time, WiFi will be used to communicate with the public in the tunnel as well as the train-based PAS system.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA is concerned about passengers exiting trains and heading to an exit that may not be viable - recognize that this is not a standard/requirement and the condition is unlikely.	10/11/22	MJS	The responder (PMPC Team) has agreed to discuss this topic and how to mitigate the potentiality during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/11/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 51
Comments Closed 51
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 01, Overview*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team/Parsons)	AG	Brad Pollock (Design Team/Parsons)	BP
Chukwuma Umolu (Design Team/Parsons)	CU	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
Peter Chou (Design Team/Parsons)	PC	L. Godbold (Design Team/Parsons)	LDG
David Fung (Design Team/Robin Chiang & Co.)	DF	Henry Chang (Design Team/Structus)	HC
Sangyoon Min (Design Team/Parsons)	SM	James Deane (CHSRA)	JD
Tony Hargitay (CHSRA)	TH	Pete Gutierrez (Caltrain)	PCG
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS		

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Section 1.2	BP	11/30/21	Townsend Station length noted as 875ft. With stair structures now at each end of station the overall length has increased.	05/09/22	KS	A	The project description has been updated, noting that the platform level will have two tracks, an 875-foot center platform for Caltrain passengers, and two 800-foot side platforms for high-speed rail passengers.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	1.2 - Project Description, Systems and Trackwork, ¶1-2	CU	11/29/21	Revise sentence to read: *Trackwork includes the mainline tracks through the tunnel and stations as well as a 1/2-mile of at-grade tracks within the existing Caltrain right-of-way that include the tie-in with Fourth & King station leads, a turnback track and maintenance-of-way storage.*	05/09/22	KS	DE	Our updated project description, which was accepted by the GEC on 5/9 reads: *Trackwork includes the mainline tracks through the tunnel and stations as well as 0.6 miles of at-grade maintenance-of-way and turnback tracks within the existing Caltrain right-of-way.*	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	1.2 - Project Description, Salesforce Transit Center Fit-out, ¶1-3	CU	11/29/21	Include provision for future BART/Muni Pedestrian Connector since it is still part of TJPA's program and design needs to account for it.	05/09/22	KS	DE	The pedestrian connector is called out under 1.5, Interface Coordination, as it is part of the TJPA's program, but no longer part of the DTX project.	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	1.5 - External Interface Coordination, Seventh bullet	CU	11/29/21	Edit to second to last bullet as follows: *Public and private utilities including SFPUC combined sewer system improvements.* Last bullet deleted	05/09/22	KS	A	Done	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	1.6 - Design Criteria Organization, Chapter 13 - Architecture	BP	11/30/21	Chapter 13 is no longer a standalone chapter for seismic design. It is indicated that Chapter 9 Geotechnical Requirements will include "seismic and ground motions performance criteria". Confirm that seismic design will also be folded into other applicable chapters (11,12 others?).	05/13/22	MM	DE	PMPC has decided to maintain Seismic as a standalone chapter.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	Section 1.6	CU	11/29/21	Add wayfinding signage to Chapter 13, Architecture	05/10/22	MJS	A	Added to Chapter 14, Architecture comments under GEC.001.	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	Section 1.7.1	CU	11/29/21	State regulations (e.g. CPUC) should be second bullet	05/13/22	MM	DE	Detailed lists of codes and regulations have been removed from Chapter 1; edit will be picked up in other chapters	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	Section 1.7.3.2	CU	11/29/21	add "FRA" to U.S. DOT bullet	05/13/22	MM	DE	Detailed lists of codes and regulations have been removed from Chapter 1; edit will be picked up in other chapters	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	Section 1.7.3.4	AG	11/29/21	Last bullet edited to read *San Francisco Public Utilities Commission Design Guidelines and Standards*	05/13/22	MM	DE	Detailed lists of codes and regulations have been removed from Chapter 1; edit will be picked up in other chapters				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	Section 1.1	PC	09/12/16	LEGACY Comment GEC16.002 - Do DTX underground station and ventilation buildings need to meet California Building Code (CBC)? If yes, we need to add CBC as the reference codes (especially for fire, life and safety or health related guidelines)	10/28/21	MM	DE	Detailed lists of codes and regulations have been removed from Chapter 1; edit will be picked up in other chapters	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.011	Section 1.2	PC	09/12/16	LEGACY Comment GEC16.003 - Add BART pedestrian tunnel component? Add new Transbay Transit Center Phase 2 component?	10/28/21	MJS	A	Section 1.2 will be replaced with the TJPA-approved DTX project description	8/5/2022	BCC	Even if deferred, the Connector is still part of the TJPA's program. The DTX design at the STC will still need to accommodate the future Connector.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.012	Section 1.6.2.3	RCCo	09/12/16	LEGACY Comment GEC16.004 - Add SF Planning "Better Street Plan" guidelines (adopted in 2011) for street/sidewalk design for any development in the public realm.	10/28/21	AG	A	Added: "San Francisco Planning Department, Better Streets Plan"	05/13/22	ROK		10/20/22	MJS	Section 1.6.2 was removed for the body of the DTX Design Criteria in Revision Book 02. A comprehensive list of all codes, standards, and regulations referenced within the DTX Design Criteria are provided in appendix B. The San Francisco Planning Department "Better Streets Plan" (2010) is included in the appendix but not referenced in the content of the criteria.	10/20/22	CC
GEC.013	Section 1.6.3.1 Page 1-7 of 9	SM	09/12/16	LEGACY Comment GEC16.005 - Operator standards for California Hi-speed rail authority shall be added	10/28/21	AG	A	Added bullets: "-Design Criteria -Environmental and Engineering Technical Memos -Notice to Designers"	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.014	Section 1.2 Page 1-1 of 9	LDG	09/12/16	LEGACY Comment GEC16.006 - 1.2 DTX Project Description needs to be expanded to include work from Mariposa Street to the Transit Center.	10/28/21	MJS	A	"Added 2 new bullets: • New U-Wall and tunnel stub box that will serve as temporary train storage, but will also accommodate a future grade separation tunnel (latter will be done by others) • New at-grade maintenance-of-way track and turnback track running adjacent to Seventh Street from Mariposa Street to Mission Bay Creek to facilitate operations" TO REPLACE WITH UPDATED DTX PROJECT DECRIPTION	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.015	Page 1-1 of 9	LDG	09/12/16	LEGACY Comment GEC16.007 - Add bullet to describe work from Mariposa Street to Caltrain Yard.	10/28/21	MJS	A	Section 1.2 will be replaced with the TJPA-approved DTX project description	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.016	Page 1-5 of 9	LDG	09/12/16	LEGACY Comment GEC16.008 - Correct title for General Order No.26-D: REGULATIONS GOVERNING CLEARANCES ON RAILROADS AND STREET RAILROADS WITH REFERENCE TO SIDE AND OVERHEAD STRUCTURES, PARALLEL TRACKS, CROSSINGS OF PUBLIC ROADS, HIGHWAYS AND STREETS.	10/28/21	AG	A	Revised title.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.017	Page 1-3 of 9	HC	09/12/16	LEGACY Comment GEC16.009 - Under the sub-heading of Chapter 11-Structures, "stations, bridges, buildings, and miscellaneous structures are lumped under "cut-and-cover structures". It is probably not intended. Please revise to clarify.	10/28/21	AG	A	Wording revised.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.018	Page 1-5 of 9	LDG	09/12/16	LEGACY Comment GEC16.010 - Correct title for General Order No. 72-B: RULES GOVERNING THE CONSTRUCTION AND MAINTENANCE OF CROSSINGS AT GRADE OF RAILROADS WITH PUBLIC STREETS, RODS AND HIGHWAYS IN THE STATE OF CALIFORNIA	10/28/21	AG	A	Revised title.	08/05/22	BCC	Not corrected on p 5-1, corrected on p 8-1	9/14/2022	MJS	Revised in Chapter 5, Codes and Standards.	9/14/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 51
Comments Closed 51
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 01, Overview*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team/Parsons)	AG	Brad Pollock (Design Team/Parsons)	BP
Chukwuma Umolu (Design Team/Parsons)	CU	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
Peter Chou (Design Team/Parsons)	PC	L. Godbold (Design Team/Parsons)	LDG
David Fung (Design Team/Robin Chiang & Co.)	DF	Henry Chang (Design Team/Structus)	HC
Sangyoon Min (Design Team/Parsons)	SM	James Deane (CHSRA)	JD
Tony Hargitay (CHSRA)	TH	Pete Gutierrez (Caltrain)	PCG
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS		

AC – Action Code
A – Responder agrees and will comply
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C – Answer provided; no action needed
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ROK – response okay
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.019	Page 1-6 of 9	LDG	09/12/16	LEGACY Comment GEC16.011 - Correct title for General Order No. 75-D: REGULATIONS GOVERNING STANDARDS FOR WARNING DEVICES FOR AT-GRADE HIGHWAY-RAIL CROSSINGS IN THE STATE OF CALIFORNIA	10/28/21	AG	A	Revised title.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.020	Page 1-6 of 9	LDG	09/12/16	LEGACY Comment GEC16.012 - Correct title for General Order No. 95: RULES FOR OVERHEAD ELECTRIC LINE CONSTRUCTION	10/28/21	AG	A	Revised title.	08/05/22	BCC	Not corrected on p 18-1	9/14/2022	MJS	Revised in Chapter 18, Codes and Standards.	9/14/2022	CC
GEC.021	Page 1-6 of 9	LDG	09/12/16	LEGACY Comment GEC16.013 - Correct title for GO 118: GENERAL ORDER No. 118-A REGULATIONS GOVERNING THE CONSTRUCTION, RECONSTRUCTION, AND MAINTENANCE OF WALKWAYS ADJACENT TO RAILROAD TRACKAGE AND THE CONTROL OF VEGETATION ADJACENT THERETO.	10/28/21	AG	A	Revised title.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.022	Page 1-6 of 9	LDG	09/12/16	LEGACY Comment GEC16.014 - Correct title for General Order No. 164: GENERAL ORDER No. 164-D RULES AND REGULATIONS GOVERNING STATE SAFETY OVERSIGHT OF RAIL FIXED GUIDEWAY SYSTEMS	10/28/21	AK	A	Revised General Order Number to GO 164-E, which supersedes GO 164-D.	08/05/22	BCC	No reference to GO-164 or 164-E found.	9/14/2022	MJS	Included in Chapter 3, System Safety and Security - codes and standards section: GO-164-E Rules and regulations governing state safety oversight of rail fixed guideway systems.	9/14/2022	CC
GEC.023	Section 1.2 Page 1-1 of 9	CU	10/18/18	LEGACY Comment GEC18.002 -	10/28/21	AG	A	Added: "(work to be done by others)" for each bullet.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.024	Section 1.2 Page 1-1 of 9	CU	10/18/18	LEGACY Comment GEC18.003 -	10/28/21	AG	A	Deleted.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.025	Section 1.2 Page 1-2 of 9	CU	10/18/18	LEGACY Comment GEC18.004 -	10/28/21	MJS	A	Section 1.2 will be replaced with the TJPA-approved DTX project description	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.026	Section 1.2 Page 1-2 of 9	CU	10/18/18	LEGACY Comment GEC18.005 - Add BART/Muni Pedestrian Connector	10/28/21	MJS	B	Section 1.2 will be replaced with the TJPA-approved DTX project description. The BART/Muni Pedestrian Connector has been deferred from the project per unanimous vote by the TJPA Board.	8/5/2022	BCC	Even if deferred, the Connector is still part of the TJPA's program. The DTX design at the STC will still need to accommodate the future Connector.	8/5/2022	KS	See response to GEC003, comment is closed.	8/5/2022	CC
GEC.027	Section 1.2 Page 1-2 of 9	CU	10/18/18	LEGACY Comment GEC18.006 -	10/28/21	MJS	A	Section 1.2 will be replaced with the TJPA-approved DTX project description	8/5/2022	ROK	Duplicate line/comment	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.028	Section 1.4 Page 1-2 of 9	CU	10/18/18	LEGACY Comment GEC18.007 - Add: The DTX shall accommodate connection to a future tunnel under Seventh Street and Pennsylvania Avenue.	10/28/21	AG	A	Added at end of last bullet: "…including futire tunnel connections"	8/5/2022	ROK					8/5/2022	CC
GEC.029	Section 1.6.2.2 Page 1-6 of 9	CU	10/18/18	LEGACY Comment GEC18.008 - Add: CPUC Requirements for Caltrain 25 kV AC Railroad Electrification System	10/28/21	AG	A	Added to CPUC list.	8/5/2022	ROK					8/5/2022	CC
GEC.030	Section 1.6.2.3 Page 1-6 of 9	DF	10/18/18	LEGACY Comment GEC18.009 - Add SF Planning "Better Street Plan" guidelines (adopted in 2011) for street/sidewalk designs	10/28/21	AG	A	Added: "San Francisco Planning Department, Better Streets Plan" (AK) Verified 2010 adoption (no superseding document) (MJS) PMPC Team made changes to the document that negate the orignal comment	8/5/2022	ROK					8/5/2022	CC
GEC.031	General	CU	10/18/18	LEGACY Comment GEC18.010 - Add CHSRA technical memoranda or design criteria for shared-corridor, low-speed operations.	10/28/21	AG	A	Added bullets: "-Design Criteria -Environmental and Engineering Technical Memos -Notice to Designers"	8/5/2022	ROK					8/5/2022	CC
GEC.032	General	PMPC	10/18/18	LEGACY Comment PMPC.004 - http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M170/K057/170057711.PDF	10/28/21	MJS	C	Noted, No update necessary	05/13/22	ROK					8/5/2022	CC
GEC.033	General	SL	10/18/18	LEGACY Comment GEC18.001 - These comments supplement those provided by the Design Team in Fall 2016.	10/28/21	MJS	C	Noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	8/5/2022	CC
HSR.001	General	JD	10/18/18	LEGACY Comment HSR18.074 - Recommend to not include any requirements that are already a regulatory requirement; e.g. NFPA 130, as those requirement change with code updates.	10/28/21	MJS	A	The PMPC team has removed redundant references to code wherever possible.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.002	General	JD	10/18/18	LEGACY Comment HSR18.079 - Need to reference climate Change evaluation and design criteria	10/28/21	MJS	A	See comment response to HSR18.073	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.003	General	JD	10/18/18	LEGACY Comment HSR18.085 - No comments on Transbay DTX Engineering Design Basis Report 20051216	10/28/21	MJS	C	Noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.004	General	JD	10/18/18	LEGACY Comment HSR18.086 - No comments on CHSRA-TJPA Train box Geometry Pkg_for FRA Signature 20130905	10/28/21	MJS	C	Noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.005	General	JD	10/18/18	LEGACY Comment HSR18.087 - No comments on Caltrain-TJPA Train box Geometry Pkg_for FRA Signature 20130905	10/28/21	MJS	C	Noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.006	General	TH	10/18/18	LEGACY Comment HSR18.088 - General Comment: The systems referred in the design have evolved significantly since 2009, when this specification was written. Please consider updating the specs to conform to current thinking and standards.	10/28/21	MJS	A	Agreed, Chapter 18 - Rail Systems and Chapter 19 - Communications references the Caltrain PCEP Design Criteria as the primary/governing document.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.001	Contents; (Pages ii through vii)	JP	06/30/22	footer: revise 'BOOK 1' to BOOK 2 on left side of page footer	08/31/22	KS	A	Editorial: All footers should be updated to reflect "BOOK 2"				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
Cal.002	Chapter 1 Section 1.7 & 1.8; (Page 1-6 of 7)	PCG	06/15/22	Chapter 1 - Overview - Part 1.7.2, 1.7.3, and 1.8.3 .Need to insure all current documents are properly described and any updates, revisions are incorporated prior to NTP of Final Design	08/31/22	MJS	C	The DTX Design Criteria is a living project document and will be updated periodically throughout project lifecycle to ensure references, codes and standards, and other related project documentation are accurate and current.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
Cal.003	Chapter 1 Section 1.8.2; (Page 1-6 of 7)	PCG	06/15/22	Anticipated NTP for Final Design?	08/31/22	MJS	C	The NTP for final design will depend on direction/decision from TJPA Board regarding the preferred contract packaging strategy approach, governance structure/document, and project master schedule. The exact timing, scope, and other details of the Final NTP will not be included in this document until such time as it has been decided.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC

Transbay Program
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Comments Closed 51
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 01, Overview*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team/Parsons)	AG	Brad Pollock (Design Team/Parsons)	BP
Chukwuma Umolu (Design Team/Parsons)	CU	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
Peter Chou (Design Team/Parsons)	PC	L. Godbold (Design Team/Parsons)	LDG
David Fung (Design Team/Robin Chiang & Co.)	DF	Henry Chang (Design Team/Structus)	HC
Sangyoon Min (Design Team/Parsons)	SM	James Deane (CHSRA)	JD
Tony Hargitay (CHSRA)	TH	Pete Gutierrez (Caltrain)	PCG
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
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Karen Saux (PMPC/Mott MacDonald)	KS		

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
TA.001	Section 1.2, Project Description (second para)	LZ	07/04/22	Make it clear that although the project limit extends to Mariposa street, it is only the turnback tracks, not the whole alignment	08/31/22	KS	C	Editorial: The DTX Project Description has been approved by the GEC and TJPA and is consistent across all project documents. No change needed.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.002	Section 1.2, Project Description (third para)	LZ	07/04/22	Specify "surface streets" as 16th St and Mission Bay Drive	08/31/22	KS	C	Editorial: The DTX Project Description has been approved by the GEC and TJPA and is consistent across all project documents. No change needed.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.003	Section 1.2, Project Description (Cut-and-Cover structures, second bullet)	LZ	07/04/22	Add "crossover" before tunnel	08/31/22	KS	C	Editorial: The DTX Project Description has been approved by the GEC and TJPA and is consistent across all project documents. No change needed.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.004	Section 1.2, Project Description (Fourth and Townsend Street Station)	LZ	07/04/22	Add 'restrooms" to passenger amenities at the station	08/31/22	KS	A	Will add				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC
TA.005	Section 1.3, DTX Project Goals (first para)	LZ	07/04/22	Delete "the following" at the end of the sentence	08/31/22	KS	A	Editorial: Revised as noted				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC
TA.006	Section 1.7, DTX Projectwide Codes, Standards, and Guidelines	LZ	07/04/22	Precedence for application of codes shows operator's criteria trumping city codes. Not sure that is correct	08/31/22	MJS	A	The order of this list of precedence will be revised as follows: 1. Federal Requirements 2. Statewide regulations 3. City codes (as applicable) 4. Operator criteria, requirements, and technical memoranda 5. Specific industry code or standard 6. California Building Code				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.007	Section 1.7, DTX Projectwide Codes, Standards, and Guidelines	LZ	07/04/22	Why was the list of regulations deleted? it is true that other regulations may apply, but that can be handled with a statement that the list is representative but not necessarily all-inclusive	08/31/22	MJS	C	The list of regulations was removed from Chapter 01, Overview because it was deemed unnecssary and redundant as each chapter provides a list of codes, standards and regulations relevant to that topic/discipline. **The PMPC maintains a complete list of all references and will include as an appendix in final submission.**				10/17/22	KS	Agree. Appendix B will list all standards, codes etc.	10/17/22	CC
TA.008	Section 1.8, Variances and Changes to Design Criteria	LZ	07/04/22	First sentence is truncated. Include what?	08/31/22	KS	A	Clarfied sentence				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC
TA.009	Section 1.8.2, Change Control	LZ	07/04/22	States that changes need to be approved by the TJPA. Should say by the Change Control Board (or Configuration Management Board) and the TJPA	08/31/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
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Total Comments 86
Comments Closed 86
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 02, Owner's Requirements*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Chukwuma Umolu (Design Team/Parsons)	CU	Henry Chang (Design Team/Structus Inc.)	HC
Carl Woods (Design Team/Parsons)	CFW	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
Peter Chou (Design Team/Parsons)	PC	E. Mortlock (Design Team/Parsons)	EM
Yiming Sun (Design Team/McMillan Jacobs Ass.)	YS	David Fung (Design Team/Robin Chiang & Co.)	DF
Uhila Makon (Caltrain)	UM	Bin Zhang (Caltrain)	BZ
Rick Bartholomew (Caltrain)	RB	Pete Gutierrez (Caltrain)	PCG
Andrew Clapham (CHSRA)	AC	James Deane (CHSRA)	JD
Paul Hebditch (CHSRA)	JD	Luis Zurinaga (SF CTA)	LZ
M. Brunner (CHSRA)	MBr	X. Banko (CHSRA)	XB
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS		

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Chapter 2; 2.1.2.b	CU	04/26/22	Have minimum headways and dwell times below been coordinated?	5/13/2022	MM	A	Edited table to just include the scheduled minimum as provided by the operators.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.002	Chapter 2; 2.1.3	CU	04/26/22	Cite CHSRA and Caltrain business plans if these are the sources of these numbers and which documents govern.	5/16/2022	MM	A	Ridership section has been updated to request designer to verify ridership ahead of design work with TJPA.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.003	Chapter 2; 2.3.2.a	CU	04/26/22	Please clarify that CHSRA train platform lengths will be limited to single train sets at STC and 4th & Townsend and that operational means will be employed for passenger access for double train sets. Provide minimum length for single train set. Cite requirements at STC agreed-to by letter, to accommodate second trainset in clear space within throat. For 4th & Townsend, the second trainset shall be accommodated east of the station	5/13/2022	MM	A	Text updated in accordance with CHSRA letter regarding the use of 800 ft platforms and use of single consist.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.004	Chapter 2; 2.5 para. 1	CU	04/26/22	This work is no longer part of the DTX project but the project must coordinate with any such reconfiguration by others	5/16/2022	MM	A	Agree. Text has been updated to reflect the modification to the at-grade trackwork and its associated impacts to Caltrain operations.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.005	Chapter 2; 2.5 para. 3	CU	04/26/22	Include Muni light rail operations	5/13/2022	MJS	A	Revised to read as follows: "The staging and implementation of the mainline DTX construction in city streets must be coordinated with the City of San Francisco Department of Public Works, Muni light rail operations, and the San Francisco Municipal Transportation Agency to minimize disruption to surface traffic and communities."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.006	Chapter 2	HC	09/12/16	LEGACY Comment GEC16.015 - Under the heading of 2.7.2 "Allowable Infiltration Rates": The criteria and Table 2.6 are not closely related to structural design but more closely related to architectural/waterproofing criteria and should be moved to Section 2.8 Architecture.	4/6/2022	MJS	B	Table 2.6, Permissible Infiltration Rates will remain under Section 2.7 Structural	8/5/2022	PAR	The response is not consistent with the Chapter 2_Owner's Requirements(Clean) as Section 2.7 was completely removed.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	2.1 (Table)	CFW	09/12/16	LEGACY Comment GEC16.016 - Remove reference to Caltrain (in-line) from: Table 2.1 Dwell Times No provision for in-line operation at TTC.	4/6/2022	AG	A	Removed.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.008	Section 2.3.1	RCCo	09/12/16	LEGACY Comment GEC16.017 - 4th & Townsend UG Station 700' Platform length is shorter than the proposed train lengths.	4/6/2022	MJS	C	Design has developed further since initial comment. Platform length now 875'.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.009	Section 2.3.1	RCCo	09/12/16	LEGACY Comment GEC16.018 - Are both types of commuter trains still consider (given recent news EMU have been selected).	4/6/2022	AG	A	EMU's have been selected. Locomotive criteria removed from text and Table 2.4.	8/5/2022	ROK		8/5/2022	MJS	PMPC Team agreed to update content based on original comment. No backcheck response was received, therefore this comment is considered closed.	8/5/2022	CC
GEC.010	Section 2.3.2	CFW	09/12/16	LEGACY Comment GEC16.019 - Total train length 400 meters = 1312' Value is correct in: Table 2.5 High-speed Train Rolling Stock Parameters	4/6/2022	AG	C	See CHSRA 2018 comment #28 and 29; length = 1,345'.	8/5/2022	ROK	Also make distinction between single and double train sets, and their respective lengths, since platforms are sized for single consists.	8/5/2022	MJS	PMPC Team agrees to update content. No backcheck response was received, therefore this comment is considered closed.	8/5/2022	CC
GEC.011	Section 2.7.3	PC	09/12/16	LEGACY Comment GEC16.020 - Is there a specific fire time-temperature curve or fire load that our structure should be designed? We should clearly refer Ch. 22 as design criteria at the end.	4/6/2022	AG	A	Added: "The DTX tunnels and stations shall be designed to accommodate the fire scenarios provided in Section 22.1".	8/5/2022	ROK		8/5/2022	MJS	PMPC Team agreed to update content based on original comment. No backcheck response was received, therefore this comment is considered closed.	8/5/2022	CC
GEC.012	Section 2.8.2	RCCo	09/12/16	LEGACY Comment GEC16.021 - Request confirmation from Caltrain if "Extreme passenger load conditions for civic and sports …." are envisioned / required for the new 4th & Townsend UG Station (none currently).	4/6/2022	AG	A	See 2018 comment #21.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.013	2.8.3	RCCo	09/12/16	LEGACY Comment GEC16.022 - Currently no sustainability performance goals are established – is this still current, if not update accordingly per what standards (City Of SF requires LEED Certification for all public projects).	4/6/2022	AK	A	Added: "Sustainable design opportunities in the areas of water savings, materials selection, and the use of recycled materials should be considered. Also, for areas affected by the presence of groundwater, methods to reduce power consumption related to dewatering pumping over the project's life cycle will be evaluated."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.014	2.1.1/2-1	EM		LEGACY Comment GEC18.011 - Second bullet point; recommend a check is made of the status of Caltrain's Back Up Central Control facility (BCCF). There was an intent to transfer primary control from San Jose CCF to the BCCF. If primary control has not yet been transferred recommend adding a second sentence to this bullet of; "Back up train control is provided for from the BCCF located in Menlo Park.:	4/6/2022	MJS	A	Updated text to read as follows: "The primary train control facility for the DTX will be located within the Caltrain Central Control Facility located outside of the DTX project."	8/5/2022	ROK	Concur	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.015	2.1.1/2-1	EM		LEGACY Comment GEC18.012 - In the 3rd bullet the term will should be shall as the mimic will be provided as part of the scope of this project?	4/6/2022	AG	A	Revised text.	8/5/2022	ROK	Concur	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.016	Section 2.1.2 Train Operations, Page 2-1 of 9	CU		[illegible] c. The Fourth and Townsend Street Station shall accommodate Caltrain service only. The expected dwell time at the Fourth and Townsend Street Station is 1 minute. Update to add CHSRA service: Update dwells	4/6/2022	AG	A	Revised text to read: "…shall accommodate both Caltrain commuter and high-speed train service."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.017	Table 2.1, Transit Center Dwell Times, Page 2-1 of 9	CU		LEGACY Comment GEC18.014 - Update dwell times	4/6/2022	AG	A	In-line dwell time removed, verify Caltrain values in table.	8/5/2022	ROK	Verify operator values.	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.018	2.1.2 f & 20.1	DF		LEGACY Comment GEC18.015 - States the Fourth and Townsend Street Station shall accommodate Caltrain service only. Confirm and update current station design if for Caltrain only or Caltrain & CHSRA	4/6/2022	AG	A	Revised text to read: "…shall accommodate both Caltrain commuter and high-speed train service."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.019	2.1.3 Table 2.2	DF		LEGACY Comment GEC18.016 - Update Ridership projections	4/6/2022	MJS	A	Figures for CHSRA updated based on Base Case 2020 BP Phase 1 - 2040 Horizon. Updated Caltrain ridership projections are still needed	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.020	Section 2.3.1 Commuter Trains, Page 2-3 of 9	CU		LEGACY Comment GEC18.017 - Update: EMU's only, 10 car trains, 875' train length.	4/6/2022	MJS	A	Removed third sentence of first bullet	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.021	2.3.1	DF		LEGACY Comment GEC18.018 - Update commuter trains types & lengths	4/6/2022	AG	A	Locomotive coaches and info removed from text and Table 2.4	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.022	Section 2.3.2 High-Speed Trains, Page 2-4 of 9	CU		LEGACY Comment GEC18.019 - Update per latest available CHSRA rolling stock requirements	4/6/2022	MJS	A	Table 2.5 Added with data	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 86
Comments Closed 86
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 02, Owner's Requirements*		
Document date:	*4/6/2022*		

Reviewers			
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Yiming Sun (Design Team/McMillan Jacobs Ass.)	YS	David Fung (Design Team/Robin Chiang & Co.)	DF
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Rick Bartholomew (Caltrain)	RB	Pete Gutierrez (Caltrain)	PCG
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GEC.023	Sect. 2.6	YS		LEGACY Comment GEC18.020 - Do the owner's seismic performance specify the return periods associated with OBE and MDE?	4/6/2022	MJS	A	Seismic performance requirements have been removed from chapter 2 and consolidated in Chapter 10 - Seismic Design. AASHTO (FEE and SEE) earthquake events will govern design.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.024	Section 2.8.2 Station Passenger Demands, Page 2-7 of 9	CU		Extreme passenger load conditions for civic and sporting events shall be accommodated by adjustments to the station operations. The DTX design shall not directly facilitate these special operating conditions. Re-visit based on latest coordination with Caltrain	4/6/2022	AK	A	What specific language should be added? Needs further coordination/alignment with Caltrain.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.025	2.8.2	DF		LEGACY Comment GEC18.022 - Confirm status quo that the station design does NOT have to account for 'extreme passenger load conditions for civic & sporting events' and/or update accordingly	4/6/2022	AK	B	Caltrain will have to write new procedures to handle both special events and emergencies for the Fourth and Townsend Station.	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.026	2.8.3	DF		LEGACY Comment GEC18.023 - Confirm status quo 'no specific sustainability performance goals have been established for the DTX project' and/or update accordingly	4/6/2022	AK	A	Repeat of comment GEC16.022: Added: "Sustainable design opportunities in the areas of water savings, materials selection, and the use of recycled materials should be considered. Also, for areas affected by the presence of groundwater, methods to reduce power consumption related to dewatering pumping over the project's life cycle will be evaluated."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.027	2.8.4	DF		LEGACY Comment GEC18.024 - Confirm status quo 'Arts for Transit' is not required at the Fourth & Townsend Station and/or update accordingly	5/16/2022	MM	C	TJPA does not have specific art requirements at the Fourth and Townsend St. Station as TJPA has an extensive art program at the Salesforce Transit Center; however, it is TJPA's expectation that some amount of art will be included in the final station design.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.028	2.9/2-8	EM		LEGACY Comment GEC18.025 - PB (now WSP) was drafting updates to CPUC GO 95 from 2009 onwards. Recommend a check is made to determine if this updated GO has been published.	4/6/2022	AG	A	Deleted last paragraph, added CPUC SED-2 in 1st paragraph.	8/5/2022	ROK	Concur	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.029	Section 2.9 Electrification, Page 2-8 of 9	CU		LEGACY Comment GEC18.026 - Update per Comment #7	4/6/2022	AG	A	Deleted last paragraph, added CPUC SED-2 in 1st paragraph.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.030	2.10/2-8	EM		LEGACY Comment GEC18.027 - Owner's Requirements; Signals and Train Control - Extend the first sentence with: "as modified by the requirements of the Caltrain Electrification Program" this will make this section consistent with other systems sections.	4/6/2022	AG	A	Added.	8/5/2022	ROK	Concur	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.031	2.10/2-8	EM		LEGACY Comment GEC18.028 - Add a 4th paragraph as follows; "The signal block design shall be coordinated with the tunnel ventilation design to meet the criteria of the maximum number of trains in ventilation section.	4/6/2022	AG	A	Added.	8/5/2022	ROK	Concur	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.032	Section 2.10 Signals and Train Control	CU		Transit Center platforms and tail track signals shall allow for adding and cutting cars. Delete **2.11 Highway Rail Grade Crossings**	4/6/2022	AG	A	Deleted.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.033	Section 2.12 Ventilation, Page 2-9 of 9	CU		LEGACY Comment GEC18.030 - Add: shall be coordinated with signal system per NFPA 130.	4/6/2022	AG	A	Revised text to read: "…ventilation system shall be coordinated with signal system per NFPA and take into account…"	8/5/2022	BCC	This was not completed.	8/31/2022	MJS	This section was removed from chapter 2. Chapter 16, Mechanical Systems and Chapter 18, Rail Systems includes language for requiring coordination of ventilation system and signaling system conforming to NFPA 130.	10/05/22	CC

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Comments Closed	**86**
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Cal.001	Chapter 2.1.1	UM	04/29/22	Reference to Caltrain's primary train control facility is Menlo Park Control Center. The backup location is San Jose Control Center. Any modifications to the primary location should be made to back up location.	5/13/2022	MJS	A	Revised to read as follows: "The primary train control facility for the DTX will be located within Caltrain's Central Control Facility (CCF) located outside of the DTX project. Any modifications to the CCF resulting from integrating the DTX must also be made to Caltrain's backup facility in San Jose.'	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Section 2.1.2	BZ	10/18/18	LEGACY Comment Cal18.001 - 2.1.2.f : Verify whether HSR will make a stop at Fourth and Townsend Street Station	4/6/2022	MJS	A	California High-Speed Rail will stop at Fourth and Townsend Street Station 4x per peak hour per direction based on latest 2020 Business Plan. Revised to read as follows: "The Fourth and Townsend Street Station shall accommodate Caltrain and high-speed rail service."	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.003	Section 2.3 Table 2.3	HL	10/18/18	LEGACY Comment Cal18.002 - Table 2.3 "DTX Infrastructure Minimum Design Life", second line item "Above-grade facilities, including bridges, .." Railway bridge should be designed for a 100-year life.	4/6/2022	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 1-9]: Major civil structures (including bridges) shall be designed for 100-years.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.004	Section 2.3 Table 2.3	HL	10/18/18	LEGACY Comment Cal18.003 - Table 2.3 "DTX Infrastructure Minimum Design Life" Please include the design life for trackwork	4/6/2022	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 1-8]: Track Systems involving the following components shall be designed for 50-years: Rail, Fastening System, Ties, Ballast, Subballast, and Subgrade.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.005	Section 2.3.1	BZ	10/18/18	LEGACY Comment Cal18.004 - 2.3.1 (first bullet): "Bi-level electric multiple unit (EMU) train sets. During peak service, these may be as long as eight cars, for a total train length of 705 feet. [ZB]10-car consists will be operated during the peak service, for a total length of 875 feet. [DK] To clarify, 10-car consists could at some future point be run given the 875 foot platforms being designed. JPB has not currently committed to this as service planning is ongoing as part of our business plan.	4/6/2022	MJS	B	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 3-10]: "Platform length: The standard platform length shall be 875 feet to accommodate a 10-car EMU consist. See Figure 3-5.." Caltrain minimum platform length will be updated throughout the design criteria to 875 feet (10-car consist).	5/16/2022	ROK		05/16/22	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.006	Section 2.8.3	BZ	10/18/18	LEGACY Comment Cal18.005 - "CALTRAIN STATIONS AND FACILITIES SUSTAINABILITY DESIGN CRITERIA" (See Appendix G in Caltrain Design Criteria) should be added in the design criteria.	4/6/2022	MJS	B	Caltrain design standards reference the CBC for sustainability design. As most of DTX facilities are underground, this code does not apply and is infeasible.				05/16/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with the applicable criteria; therefore this comment is considered closed.	05/16/22	CC
Cal.007	Section 2.11	RB	10/18/18	LEGACY Comment Cal18.006 - CPUC General Order 88-B must be filed prior to permanent and temporary modifications to existing crossings.	4/6/2022	MJS	C	CPUC GO 88-B was created with the purpose to establish criteria for alteration of existing public highway-rail crossings.				05/16/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with the applicable criteria; therefore this comment is considered closed.	05/16/22	CC
Cal.008	Chapter 2 Section 2.3.3; (Page 2-4 of 5)	PCG	06/15/22	Will ventilation be adequate and will diesel equipment be required to be equipped with scrubbers? Will HiRail inspection vehicle be electric?	10/10/2022	MJS	A	Revised last sentence of section as follows: "Operating procedures will need to be written and approved by the operators for to ensure adequate ventilation and the safe operation of diesel-powered locomotives in the DTX tunnel."				10/10/2022	MJS	The responder (PMPC Team) has confirmed that the criteria is compliant with the applicable criteria; therefore this comment is considered closed.	10/10/2022	CC

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HSR.001	Chapter 2, 2.1.1 - Operations Control	AC	04/22/22	Why are the 'Caltrain Central Control Facility' location(s) not specified in this section of the DCM?	5/13/2022	MJS	A	Revised per Comment #Cal.001 as follows: "The primary train control facility for the DTX will be located within Caltrain's Central Control Facility (CCF) located outside of the DTX project. Any modifications to the CCF resulting from integrating the DTX must also be made to Caltrain's backup facility in San Jose."	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.002	Chapter 2, 2.1.1 - Operations Control	AC	04/22/22	Has the provision of the emergency mimic train control facility at the Salesforce Transit Center been considered fully from the perspective of the interface with CEMOF/Menlo Park, in terms of control authority, operability, safety etc.?	5/16/2022	MM	C	Caltrain is still assessing their needs with regards to the emergency mimic train control facility. TJPA is working closely with Caltrain on the systems related submittals to ensure Caltrain's needs are met. If a criteria becomes available, it will be included in the next issue of the design criteria.				5/16/2022	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.003	Chapter 2, Table 2-1 Dwell Times	AC	04/22/22	The CHSR dwell times at the Transbay Center station specified in this table contradict the Phase 1 Service Plan Technical Memoranda - TM states a requirement of 30 minutes	5/16/2022	MM	A	Agree. Dwell times have been updated to 20 minutes for both Caltrain and CHSRA in accordance with values provided in the Phasing Study Operations Analysis.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.004	Chapter 2, Table 2-3 Minimum Design Life	AC	04/22/22	25 years as a blanket minimum design life is not reasonable/achievable for all train control assets - this is also not in accordance with the Caltrain Design Guidelines (Chapter 1)	5/16/2022	MM	A	Updated in accordance with Caltrain Design Guidelines Chapter 1.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.005	Chapter 2, 2.3.2 - High Speed Trains	AC	04/22/22	Where have the acceleration and deceleration rates referenced in this section to inform the signaling layout design been derived from? These do not align with the HSR rolling stock specification, or the technical memoranda.	5/24/2022	MM	C	CHSRA has responded via email from Tom Newey on 5/24/22 that the rates will be included in CHSRA's upcoming vehicle procurement. The values will be removed from the DTX Design Criteria and a reference will be made to the future vehicle procurement providing this information.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.006	Chapter 2, 2.5 - Operations During Construction	AC	04/22/22	Acceptable level of service' in terms of construction impact on operations would benefit from being defined more clearly. Either a specified level of acceptable performance impact could be stated, or a process that must be followed to mitigate operations impacts could be specified.	5/16/2022	MM	C	This information will be provided in the bid documents for each construction package as the impacts may differ based on agreements with appropriate stakeholders.				5/16/2022	MM	The responder (PMPC Team) has provided a response that is acceptable to TJPA; therefore this comment is considered closed.	05/16/22	CC
HSR.007	Chapter 2, 2.6 - Guideway inspection and maintenance	AC	04/22/22	This section would benefit from a statement regarding which organization is expected to inspect and maintain the infrastructure. Unclear whether an organization within the TJPA or the PCJPB will be responsible. If this is not suitable for inclusion here, a reference to a document detailing the breakdown of responsibilities between all relevant parties for maintenance of all assets would be sensible.	5/16/2022	MM	C	A governance study is underway. The next revision of the design criteria can include any agreements made therein.				5/16/2022	MM	The responder (PMPC Team) has provided a response that is acceptable to TJPA; therefore this comment is considered closed.	05/16/22	CC
HSR.008	Chapter 2, pare 2.1.2 b	PH	05/02/22	CHSRA normal revenue operating hours are 6:00 a.m. to midnight every day of the week. Please revise weekend hours to align with this.	5/16/2022	MM	A	Opening time has been updated to 6 am on weekends, the closing time is consistent with planned TJPA operations at the stations. It will be updated in the next revision of the design criteria based on governance conversations which are on-going.				5/16/2022	MM	The responder (PMPC Team) has provided a response that is acceptable to TJPA; therefore this comment is considered closed.	05/16/22	CC
HSR.009	Chapter 2, para 2.1.2 d	PH	05/02/22	Note that this headway applies to each track individually	5/13/2022	MJS	A	Revised to read as follows: "Track and signal layout must accommodate a minimum capacity of 2-minute 45-second headways for combined Caltrain commuter and CHSRA high-speed service on each track in each direction during the peak period. "	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.010	Chapter 2, para 2.1.2 f	PH	05/02/22	Minimum dwell time of 2 mins is correct for CHSRA, but TJPA should check with Caltrain for their minimum time as this may be shorter	5/16/2022	MM	C	Caltrain has provided a dwell of 2 minutes for all operations analysis that have been performed.	5/16/2022	ROK		05/16/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/16/22	CC
HSR.011	Chapter 2, Table 2-1	PH	05/02/22	For consistency, either delete "(Stub End)" from Caltrain row or add it to CHSRA row. Also consider amending table to include Fourth and Townsend dwell times for completeness	5/13/2022	MJS	A	Revised as noted (removed "Stub End")	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.012	Chapter 2, para 2.1.3	PH	05/02/22	I propose that these numbers are reviewed and updated with the figures being used in the FTA funding submission.	5/16/2022	MM	A	Ridership section has been updated to request designer to verify ridership ahead of design work with TJPA.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.013	Chapter 2, para 2.3.2	PH	05/02/22	Revise a. to describe a single high-speed trainset at 205m. Add b. stating that, "The DTX shall be designed to accommodate HSR services comprising a double trainset with a total length of 405m."	5/16/2022	MM	A	Text updated in accordance with CHSRA letter regarding the use of 800 ft platforms and use of single consist.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.014	Chapter 2, para 2.3.2, second para after Table 2-5	PH	05/02/22	Why, even after allowing for baggage, are HSR passengers heavier than Caltrain passengers?	5/18/2022	MM	A	Agree. Updated criteria to meet FAA standards (210 lbs. including baggage).	5/18/2022	ROK		5/18/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/18/22	CC
HSR.015	Chapter 2, para 2.3.2, final para	PH	05/02/22	Delete sentence referring to yard circulation tracks as the DTX has no such tracks. Revise second sentence to make clear that the minimum acceptable horizontal curve radius is 650' and the maximum acceptable gradient is 3%. (You may wish to align the wording here with that used in Track chapter of the DCM.) I also note that no curve or gradient criteria are included in section 2.3.1 covering Commuter trainsets.	5/16/2022	MM	A	Agree, removed paragraph for consistency with Commuter trainset section. Guideway geometrics are included in Ch. 7.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.016	Chapter 2, para 2.3.3	PH	05/02/22	An additional sentence should be added here to note the operating procedures will need to be written and approved by the operators for the safe operation of diesel trains on the DTX. Are you sure that use of diesel maintenance and recovery trains is acceptable under NFPA 130?	5/17/2022	MM	A	Agree. Sentence has been added as well as a requirement for the use of the ventilation system during operation of diesel trains. 2020 NFPA 130 acknowledges the use of "nonelectric" vehicles. Specifically, Chapter 1 Administration states that NFPA is applicable to the design of rail system as follows: 1.3.4 This standard shall also apply as a basis for fixed guideway transit and passenger rail systems where nonelectric and combination electric-other (such as diesel) vehicles are used. Where such vehicles are not passenger-carrying vehicles or are buses or trolley coaches, the standard shall not apply to those vehicles but shall apply to the fixed guideway transit and passenger rail systems in which such vehicles are used. Based on the paragraph above, it's clear that NFPA 130 recognizes and allows for the use diesel maintenance and recovery trains.	5/18/2022	ROK		5/18/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/18/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**86**
Comments Closed	**86**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 02, Owner's Requirements*		
Document date:	*4/6/2022*		

Reviewers

Name	Initials	Name	Initials
Chukwuma Umolu (Design Team/Parsons)	CU	Henry Chang (Design Team/Structus Inc.)	HC
Carl Woods (Design Team/Parsons)	CFW	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
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HSR.017	Chapter 2, para 2.5	PH	05/02/22	Add a sentence, "CHSRA is not expected to begin operations until construction of the DTX is complete. However should this situation change then efforts must be made to maintain an acceptable level of service for CHSRA during construction."	5/16/2022	MM	A	Agree. Text added to note that operations include a potential interim station at Fourth and King Street Station for CHSRA.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.018	Section 2.1.2.b/ 2-1	PH		LEGACY Comment HSR18.008 - Weekend leisure travel is likely to be a big market for HSR s consideration may want to be given to an earlier start than 7am	5/16/2022	MM	A	See response to Comment HSR.008.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.019	Section 2.1.2.c/ 2-1	PH		LEGACY Comment HSR18.009 - European rail experience would suggest that for long distance high speed travel Sunday afternoon / evening will also have peak loadings	5/16/2022	MM	C	Noted. Though since Caltrain service does not have a peak that coincides with Sunday afternoon, the use of a peak period CHSRA service plan (4 trains per hour per direction) on Sunday afternoon will not constitute peak level service for the DTX tunnel.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.020	Section 2.1.2.d/ 2-1	PH		LEGACY Comment HSR18.010 - Revise this clause to require "headways of no more that 2min 45sec"	4/6/2022	AG	A	Revised as noted.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.021	Table 2.1, 2-1	PH		LEGACY Comment HSR18.011 - CHSR dwell times should be Absolute minimum 15 min and Scheduled minimum 20 min	4/6/2022	AG	A	Revised as noted.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.022	Section 2.1.2.f/ 2-1	PH		LEGACY Comment HSR18.012 - Provision for CHSR to call at 4th and Townsend must be made, with dwell times of 2 mins	4/6/2022	MJS	A	Section 2.1.2.f revised to read as follows: "The Fourth and Townsend Street Station shall accommodate Caltrain and high-speed rail service. The expected minimum dwell time at the Fourth and Townsend Street Station is two (2) minutes."	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.023	Section 2.10, 2-8	PH		LEGACY Comment HSR18.013 - Include note requiring that the train control system be compliant with positive train control requirements	4/6/2022	AG	A	Revised 1st paragraph, 1st sentence to read: "…shall be an extension of the Caltrain system and as such, compliant with positive train control requirements."	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.024	Section 2.13.3, 2-9	PH		LEGACY Comment HSR18.014 - Add after first sentence - Where reasonably practicable remote condition monitoring equipment shall be used	4/6/2022	AG	A	Added.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.025	Section 2.3.1, 2-3	MBr		LEGACY Comment HSR18.022 - 2.3.1 Commuter Trains - Average Electric locomotive length is 72' ~ 67', EMU average maximum power per powered Bi Level EMU is 2.2 MVA if a 8 car consist has 4 trailers (non-powered) the average power will be 1.1 MVA per car. Change go 8.8 MVA per train.	5/18/2022	MM	DE	Measurements have been updated per static envelope from Stadler. Wheel power output has been updated per Stadler's website.				5/18/2022	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/18/22	CC
HSR.026	Table 2.4, 2-3	MBr		LEGACY Comment HSR18.023 - Table 2.4 Caltrain Rolling Stock Parameters - Bi-Level EMU Tare Weight approximately 120,000 lbs.	4/6/2022	MJS	A	Revised table (content moved to Chapter 18 - Rail Systems)	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.027	Section 2.3.1, 2-4	MBr		LEGACY Comment HSR18.024 - 2.3.1 Commuter Trains - braking rates for all types of rolling stock from speeds of 100-0 mph shall be 1.7 mph/sec full service and 2.0 mph/sec emergency on level tangent dry track as a minimum	4/6/2022	MJS	A	Revised as noted.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.028	Section 2.3.1, 2-4	MBr		LEGACY Comment HSR18.025 - 2.3.1 Commuter Trains - ALP-46 locomotive, an adhesion rate of 33% shall be assumed for load flow purposes. An adhesion rate of 7% (Needs clarification?)	4/6/2022	AG	C	Deleted paragraph; EMUs to be used.				05/13/22	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.029	Section 2.3.2, 2-4	XB		LEGACY Comment HSR18.026 - 2.3.2 - replace reference to the "ICE (Velaro) model" as follows…"are currently based upon candidate wide-body HSR trainsets."	4/6/2022	AG	A	Revised text as directed.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.030	Section 2.3.2.a, 2-4	XB		LEGACY Comment HSR18.027 - 2.3.2 a - single trainset length to be increased to 205 meters, Double traction trainset length to be increased to 410 meters. To be confirmed with future trainset procurement contract.	4/6/2022	AG	A	Updated lengths.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.031	Section 2.3.2.b, 2-4	XB		LEGACY Comment HSR18.028 - 2.3.2 b - total trainset length to be increased to 1,345 feet (double traction).	4/6/2022	AG	A	Updated length.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.032	Table 2.5, 2-4	XB		LEGACY Comment HSR18.029 - DOUBLED TRACTION 410 METER TRAINSET Table 2.5 - requires updates as follows: Length (ft) = 1,345 Width (ft) = 11.084 Height (ft) = 15 (Over locked down pantograph) Weight (lbs.) = (AW0) 1,920,000 ~ 60 US Tons / car Aux. Power (kW) = 1600 Traction Max. Output Power at rail (kW) = 22,000 Performance Criteria to be released with future trainset procurement contract.	4/6/2022	AG	A	Updated Table 2.5.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.033	Section 2.3.2, 2-4	XB		LEGACY Comment HSR18.030 - 2.3.2 - Average passenger weight (including luggage = 15 pounds) to be increased to 215.5 pounds.	4/6/2022	MJS	A	Revised as suggested	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.034	Section 2.3.2, 2-4	XB		LEGACY Comment HSR18.031 - Trainset decelerations rates: braking rates from speeds of 100-0 mph shall be 1.7 mph/sec full service and 2.0 mph/sec emergency on level tangent dry track as a minimum. Trainset Acceleration rate: shall be 1.3 mph/sec from 0 mph to 60 mph	4/6/2022	AG	A	Revised numbers.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.035	Table 2.2, 2-2	JD		LEGACY Comment HSR18.072 - CHSRA to provide updated ridership based on 2018 Business Plan for Salesforce and 4th & Townsend	5/16/2022	MM	A	Ridership section has been updated to request designer to verify ridership ahead of design work with TJPA.	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.036	Section 2.4, Chapter 2 General	JD		LEGACY Comment HSR18.073 - Need to include Climate Change evaluation criteria	4/6/2022	MJS	A	This section has been updated to reflect design considerations required for the 100-year storm event with sea level rise over the project life (100-years).	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.037	Section 2.1.2.f, 2-1 & Section 20.1, 20-1	XB		LEGACY Comment HSR18.021 - 2.1.2 F and 20.1 - Confirm that the Fourth and Townsend Street Station is to accommodate Caltrain service only. HSR requires usage at the Fourth and Townsend Station.	4/6/2022	AG	A	Revised text to read: "…shall accommodate both Caltrain commuter and high-speed train service."	5/16/2022	ROK		5/16/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
TA.001	Section 2.1.3, Ridership	LZ	07/04/22	Why was the ridership table removed?	8/31/2022	MJS	C	The ridership data was removed because the data provided from Caltrain and CHSRA was not completed/executed consistently. Ridership data will need to be updated based on updated inputs and post-COVID figures and verified by TJPA prior to inclusion in the DTX Design Criteria.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.002	Section 2.3.1, Commuter Trains (first para)	LZ	07/04/22	States that criteria "assumes that Caltrain trains". No need to assume Caltrain trains are under production and some have been delivered. All information about them is readily availabe, no need for assumptions	8/31/2022	KS	A	Editorial: PMPC to update accordingly				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC

Transbay Program
Downtown Rail Extension (DTX)
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Total Comments 86
Comments Closed 86
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 02, Owner's Requirements*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Chukwuma Umolu (Design Team/Parsons)	CU	Henry Chang (Design Team/Structus Inc.)	HC
Carl Woods (Design Team/Parsons)	CFW	Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo
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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
TA.003	Section 2.3.1, Commuter Trains (Table 2-4)	LZ	07/04/22	It may be more useful to use seated capacity and standing capacity instead of standing sq feet available	8/31/2022	MJS	B	The Caltrain EMU Design Parameters (Table 2.3) were taken directly from the Stadler Rail KISS EMU fact sheet. TJPA/PMPC will not make assumptions based on allowable capacity per SQFT.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.004	Section 2.3.1, Commuter Trains (First bullet)	LZ	07/04/22	It would be more appropriate to use crush loading capacity than only fully-seated passenger load. sentence needs rewording	9/1/2022	MM	A	This is true for Caltrain trains. Sentence to be reworded.				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC
TA.005	Section 2.3.1, Commuter Trains (Third bullet)	LZ	07/04/22	If one standee per 1.8 sq ft is used here, the same should be used on 2nd bullet above for propulsion	9/1/2022	MM	A	I have updated the definitions for AW1, AW2, and AW3 so that there is no confusion.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.006	Section 2.3.1, Commuter Trains (Third bullet)	LZ	07/04/22	States: "do not assume that regeneerative brakes will be used." I believe regenerative brakes are being provided for the EMUs. Please confirm	9/1/2022	MM	C	The Caltrain EMU will have regenerative braking capabilities but for the purpose of these calculations it is more conservative to assume no regenerative braking.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.007	Section 2.3.2, High-speed Trains (third para below Table 2-5)	LZ	07/04/22	The assumption of 15lbs of luggage for HSR passengers seems low, since many passengers will most likely be carying more that just a briefcase	8/31/2022	MJS	B	The assumed average weight of 15lbs of luggage per HSR passenger was coordinated with and approved by CHSRA.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC
TA.008	Section 2.3.3, Maintenance Equipment and Work Trains (First para)	LZ	07/04/22	States that diesel-powered locomotives wil be used for maintenace. Dual mode (electric/battery) -powered locomotives would be much cleaner. Even if diesel is preferred, locos should be dual mode (electric-diesel) so as to minimize diesel use	9/1/2022	MM	C	At this time, Caltrain has informed TJPA that they plan to continue use of their current maintenance equipment which is diesel. As noted, diesel is a less clean source so this is a conservative approach. If Caltrain changes position in the future, the design criteria can be updated.				10/03/22	MJS	The responder (PMPC Team) answered the inquiry, no change required - comment considered closed.	10/03/22	CC

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Total Comments 7
Comments Closed 7
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 03, Safety and Security*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Chukwuma Umolu (Design Team/Parsons)	CU	James Deane (CHSRA)	JRD
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Karen Saux (PMPC/Mott MacDonald)	KS

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Chapter 3, Codes, Standards & Guidelines	CU	11/29/21	Add NFPA 130 and any other relevant NFP guidelines. Add California Building Code	05/09/22	KS	A	NFPA 130 and CBC added	08/05/22	ROK		08/05/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	08/05/22	CC
GEC.002	3.2 - Safety and Security Certification, ¶3-1	CU	11/29/21	Suggest identifying roles of FLS Committee relevant to all design phases.	05/16/22	MM	DE	Revised to read as follows: "The documentation will comprise a series of certificates attesting to conformance with safety and security requirements of the individual system elements, procedures, and training programs."	08/05/22	ROK		08/05/22	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	08/05/22	CC
HSR.001	3 - General	JRD	04/15/22	CH 3 should address Crime Prevention thru Environmental Design except as reference- what do you want them to do?	05/13/22	MM	C	TJPA's Threat and Vulnerability Assessment and associated project-specific criteria will address this item.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.002	3 - General	JRD	04/15/22	CH 3 should address ATPA safety and security guidelines and standards	05/13/22	MM	C	TJPA's Threat and Vulnerability Assessment and associated project-specific criteria will address this item.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.003	3 - General	JRD	04/15/22	CH 3 does not address anti-terror provisions	05/13/22	MM	C	TJPA's Threat and Vulnerability Assessment and associated project-specific criteria will address this item.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.004	3 - General	JRD	04/15/22	CH 3 consider accident prevention thru design processes	05/13/22	MM	C	TJPA's Threat and Vulnerability Assessment and associated project-specific criteria will address this item.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
TA.001	Chapter 3, System Safety and Security (Codes, Standards, and Guidelines, first sentence)	LZ	07/04/22	Add "will" before "guide"	9/1/2022	MJS	A	Revised as noted (will was added but there is no "Guided" in the sentence)				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 9
Comments Closed 9
% Complete 100%

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Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 04, Environmental Requirements*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Brad Pollock (Design Team/Parsons)	BP	Rebecca Wong (Design Team/Parsons)	RW
Peter Chou (Design Team/Parsons)	PC	S. Leidy (Design Team/Parsons)	SL
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS		

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GEC.001	4.5 - Floods, ¶1-1	CU	11/29/21	Reference, coordinate with language in Hydrology section of 05 Civil Design chapter	05/11/22	KS	A	Reference to Chapter 5, Civil Design, added.	08/05/22	ROK		08/05/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	08/05/22	CC
GEC.002	4.8.1 - Geotechnical Data, ¶1-1	RW	11/29/21	These documents are in the process of being updated. Referenced dates will need to be revised.	05/16/22	MM	A	References updated to current geotechnical reports.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.003	Section 4.1 Elevation, Page 4-1 of 3	CU	10/18/18	LEGACY Comment GEC18.031 - **4.1 Elevation** The ground surface elevation over the extent of the DTX alignment varies from a minimum of 10 feet to a maximum of 65 feet approximately based upon NAVD 88 (North American Vertical Datum of 1988). Top of rail elevation varies from 15 feet at grade with the Caltrain Yard to -33 feet 8 inches at the Transit Center. Delete	10/28/22	MJS	A	Deleted.	08/05/22	ROK		08/05/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	08/05/22	CC
GEC.004	DC 4.8.1	PC	10/18/18	LEGACY Comment GEC18.032 - We will have to update all references to geotechnical documents; perhaps not providing dates?	10/28/22	MJS	A	References updated to current geotechnical reports.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.005	DC 4.8.4	PC	10/18/18	LEGACY Comment GEC18.033 - Simply reference to geotechnical documents?	10/28/22	MJS	A	References updated to current geotechnical reports.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.006	General	SL	09/12/16	LEGACY Comment GEC16.001 - Did not review drainage/hydrology design criteria	10/28/22	MJS	C	Noted. The PMPC team has researched sea level rise and 100-year storm event - a technical memorandum has been issued to the design team reflecting findings.				05/16/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.007	Section 4.11, Noise and Vibration (first sentence)	RW	08/16/22	Section 4.11 references "Section 2.15 of the Final SEIS/EIR.." - this should be updated to "Section 2.12"	09/01/22	MJS	A	Revised as noted.				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
Cal.001	Chapter 4 Section 4.2; (Page 4-2 of 4)	PCG	06/17/22	Environmental Requirements: Be beneficial to have projected ambient temperatures within the tunnel and covered section of the track system - Helpful in determining the desired rail neutral temperature	09/01/22	MJS	C	The ambient temperature and humidity ranges for the tunnel will be determined through analysis/design work and will depend primarily upon the air flow modeling and ambient air exchange and mechanical damper system. It is not our intent to include this as a design criteria.				10/06/22	MJS	The responder (PMPC Team) has agreed to provide ambient/design temperature and humidity ranges within the tunnel and underground structures during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/06/22	CC
TA.001	Section 4.9, Atmospheric Pollution and Contamination (second para)	LZ	07/04/22	For clarity add "of the SEIS/EIR" after "D.2"	09/01/22	MJS	C	Sentence currently reads as follows (no change necessary): "Requirements for mitigating air quality impacts of the DTX are specified in Appendix D.2 of the Final SEIS/EIR."				09/27/22	MJS	The responder (PMPC Team) clarified that the DTX guideway geometrics (Chapter 7) and trackwork (Chapter 8) are governed by Caltrain Design Criteria.	09/27/22	CC

Transbay Program
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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 05, Civil Design*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team)	AG	Chukwuma Umolu (Design Team)	CU
Q. Mehirdel (Design Team)	QM	S. Leidy (Design Team)	SL
Charles Felder (Design Team/CHS)	CF	Paul Hebditch (CHSRA)	PH
M. Brunner (CHSRA)	MBr	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS	Meghan Murphy (PMPC/AECOM)	MM

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GEC.001	Chapter 5, Codes and Standards, (new) Sixth bullet	AG	11/30/21	Edited to add: San Francisco Public Utilities Commission Design Guidelines & Standards CPUC General Orders	05/13/22	KS	A	Done				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	Chapter 5, Codes and Standards, Fourth bullet	AG	11/30/21	Revise to read as follows: "San Francisco Public Works (SFPW) Standard Specifications and Plans"	05/09/22	KS	A	Done				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	Chapter 5, Codes and Standards, (new) Last bullet	CU	11/30/21	Add "CPUC General Orders" and include those that apply	05/13/22	MJS	A	To be revised as noted.	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	5.2.1.1 - Geometric Design, ¶3-1	CU	11/29/21	Design of at-grade crossings per CPUC General Orders 36-D, 72-B, 75-B, 88-B and 135.	05/13/22	KS	A	Done	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	5.4.4 - Drainage Infrastructure, ¶1-2	CU	11/29/21	Edit to read: "SFPW Standard Plans and Specifications"	05/09/22	KS	A	Done	8/5/2022	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	5.6.2 - Access, ¶2-1	AG	11/29/21	Edit to read: "Temporary interruptions to local access to businesses and residences must be coordinated and agreed ***upon*** with the respective owners."	05/09/22	AK	A	Revised to read: *Temporary interruptions to local access to businesses and residences must be coordinated and agreed to by the respective owners.*				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	Section 5.1.1, Page 5-2, (Table 5.1)	QM	09/12/16	LEGACY Comment GEC16.023 - Benchmark AB 7679: revise Northing to 37 42 22.15227, revise Easting to 122 23 36.90516 (per NGS online database)	10/28/21	AG	B	Agree, confirmed online.	11/18/21	ROK	11/18/21 WS per meeting with Chaudhary on 11/1/21 they recommend we continue to use Transit Center Horizontal Datum NAD83 (1991.35). The Northing and Eastings proposed revisions refer to NAD83 (2011). Ref: https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=AB7679				05/04/22	CC
GEC.008	Section 5.1.1, Page 5-2, (Table 5.1)	QM	09/12/16	LEGACY Comment GEC16.024 - Benchmark AB 7677: revise Northing to 37 44 00.33842, revise Easting to 122 29 49.03249 (per NGS online database)	10/28/21	AG	B	Agree, confirmed online.	11/18/21	ROK	11/18/21 WS per meeting with Chaudhary on 11/1/21 they recommend we continue to use Transit Center Horizontal Datum NAD83 (1991.35). The Northing and Eastings proposed revisions refer to NAD83 (2011). Ref: https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=AB7677				05/04/22	CC
GEC.009	Section 5.1.2, Page 5-2, (Table 5.2)	QM	09/12/16	LEGACY Comment GEC16.025 - Benchmark HT0685: revise Easting to 122 23 33 (per NGS online database)	10/28/21	AG	B	Agree, confirmed online.	11/18/21	ROK	11/18/21 WS per meeting with Chaudhary on 11/1/21 they recommend we continue to use Transit Center Horizontal Datum NAD83 (1991.35). The Northing and Eastings proposed revisions refer to NAD83 (2011). Ref: https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=HT0685				05/04/22	CC
GEC.010	Page 5-2, Section 5.1.2, (Table 5.2)	QM	09/12/16	LEGACY Comment GEC16.026 - Benchmark HT0685: revise Northing to 37 47 39 (per NGS online database)	10/28/21	AG	C	Northing in Design Criteria already correct: 37 47 39.		ROK					05/04/22	CC
GEC.011	Section 5.2.1.1, Page 5-3, Line 5	QM	09/12/16	LEGACY Comment GEC16.027 - "… all AASHTO standard bus vehicles" is too general, further direction needed on specific bus type that shall be accommodated (i.e., City Transit, Intercity, Articulated, etc.)	10/28/21	AK	A	Included text that clarifies which AASHTO design vehicles we are designing to: "…SU-30, WB-40, and BUS-40"	11/18/21	ROK	Text added	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.012	Section 5.6, Page 5-7, Line 3	QM	09/12/16	LEGACY Comment GEC16.028 - Add the following after "Traffic Control Devices," : "California Highway Design Manual, Caltrans Traffic Manual,"	10/28/21	AG	A	Added.	11/18/21	ROK	"California Temporary Traffic Control Handbook (CATTCH), Caltrans Highway Design Manual (HDM)" added	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.013	Section 5.2.1.2, Page 5-3, Paragraph 2	SL	09/12/16	LEGACY Comment GEC16.029 - "If vertical clearance is limited between road surface and top of utilities (less than 3 feet), provision will be made for armoring the utility and/or backfilling with a lean concrete mix or controlled density fill material." For the 3' clearance, what standard is this referencing? Also, different utility companies might have different clearance standards, should also include statement that should follow specific utility requirements as well. Is project on City streets only? If project is on Caltrans right-of-way, they might require a concrete cap with a slurry backfill for utilities. If a lean concrete mix or controlled density fill is needed, which applicable standard/spec will be followed?	10/28/21	MJS		Removed "(less than 3 feet)" from section. Will include reference to Chapter 6 - Utilities for specific utility criteria references.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.014	Section 5.1 Survey Control, Page 5-2 of 8	CU	10/01/18	LEGACY Comment GEC18.034 - Update to incorporate any new control points established Phase One.	10/28/21	AK	C	Verified horizontal control points in previous Project Survey Control document from Chaudhary in 2010. No new control points.	8/5/2022	ROK					05/04/22	CC
GEC.015	Section 5.6	CF	10/01/18	LEGACY Comment GEC18A.002 - The intro paragraph sites a Maintenance and Protection of Traffic Plan. Please clarify whether this is meant to be a stand-in term for what will be Traffic Management Plan (within the context of the design criteria).	10/28/21	AK	A	Yes, this will be the Traffic Management Plan (TMP). References to a "MPT Plan" have been changed to refer to the future TMP instead.		ROK	Wording revised	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.016	Section 5.6	CF	10/01/18	LEGACY Comment GEC18A.003 - The AASHTO Policy on Geometric Design of Highways and Streets, as well as the Caltrans Manual of Uniform Traffic Control Devices, are for a Traffic Control Plan, and would not be appropriate for a Traffic Management Plan.	10/28/21	AK	A	Wording has been revised to include a Temporary Traffic Control (TTC) Plan as part of the TMP.		ROK	Wording revised	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.017	5.6.1	CF	10/01/18	LEGACY Comment GEC18A.004 - Paragraph 3 states that "Road closures may be required…" Note that detours may also be required, and the road closures would occur on weekday nights and weekends only.	10/28/21	AG	A	Revised text to read: "Road closures and detours may be required…" Added last sentence to paragraph 3: "Road closures shall only occur on weekday nights and weekends."		ROK	Wording revised	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.018	5.6.1	CF	10/01/18	LEGACY Comment GEC18A.005 - No reference is made to potential transit delay (for example, the Central Subway will be running along the center of 4th Street between Bryant Street and Townsend Street).	10/28/21	AK	A	Added paragraph: "Transit routes in the area may also be affected by construction activities. Detours may be provided for transit routes that run on the surface streets above the DTX alignment, which may also cause potential transit delays during construction. Proper protection or decommissioning procedures of the OCS for Muni may be needed, which shall be provided by others."		ROK	Wording revised	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.019	5.6.2	CF	10/01/18	LEGACY Comment GEC18A.006 - The coordination with business and residence access would be for a Traffic Control Plan. CHS's Traffic Management Plan will focus on analysis, and will not include local business/resident outreach.	10/28/21	AK		Will coordinate with TJPA and discuss the logistics of the Traffic Management Plan.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.020	5.6.3	CF	10/01/18	LEGACY Comment GEC18A.007 - This section is appropriate for a Traffic Control Plan, not for a Traffic Management Plan.	10/28/21	AK	A	Wording has been revised to include a Temporary Traffic Control (TTC) Plan as part of the TMP.		ROK	Wording revised	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.021	5.6.4	CF	10/01/18	LEGACY Comment GEC18A.008 - This section references DPT, but the appropriate agency would be SFMTA.	10/28/21	AG	A	Revised.		ROK	Reference to SFMTA/DPT has been removed	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC

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Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 05, Civil Design*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team)	AG	Chukwuma Umolu (Design Team)	CU
Q. Mehirdel (Design Team)	QM	S. Leidy (Design Team)	SL
Charles Felder (Design Team/CHS)	CF	Paul Hebditch (CHSRA)	PH
M. Brunner (CHSRA)	MBr	Joel Pancoast (Caltrain)	JP
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GEC.022	5.6.4	CF	10/01/18	LEGACY Comment GEC18A.009 - Drawings are appropriate for a Traffic Control Plan, not for a Traffic Management Plan.	10/28/21	AK	A	Wording has been revised to include a Temporary Traffic Control (TTC) Plan as part of the TMP.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.023	5.6.5	CF	10/01/18	LEGACY Comment GEC18A.010 - This section is appropriate for a Traffic Control Plan, not for a Traffic Management Plan.	10/28/21	AK	A	Wording has been revised to include a Temporary Traffic Control (TTC) Plan as part of the TMP.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.024	5-1 Codes and Standards	CU/SM	07/05/22	For the sub-bullets for "California Public Utilities Commission General Orders": Fix capitalization and correct title of 72-B RULES GOVERNING THE CONSTRUCTION AND MAINTENANCE OF CROSSING AT GRADE OF RAILROADS WITH PUBLIC STREETS, ROADS AND HIGHWAYS IN THE STATE OF CALIFORNIA	09/01/22	MJS	A	All references (and list of references) have been checked				11/10/22	KS	Occurences of this standard are consistent	11/10/22	CC
GEC.025	5.5.1 General Requirements	CU	07/04/22	References to "SFPW" are not accurate - it is the "San Francisco Department of Public Works"	11/10/22	KS	A	Revised				11/10/22	KS		11/10/22	CC
GEC.026	5.5.2.1	HK/BP	08/04/22	Remove 12" freeboard requirement per June 2022 coordination	09/01/22	MJS	A	Agree. Will update text to match PMPC flooding and sea level rise memorandum.				11/10/22	KS	Memorandum refernced in Section 4	11/10/22	CC

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 05, Civil Design*		
Document date:	*10/28/2021*		

Reviewers			
Name	Initials	Name	Initials
Alex Geyer (Design Team)	AG	Chukwuma Umolu (Design Team)	CU
Q. Mehirdel (Design Team)	QM	S. Leidy (Design Team)	SL
Charles Felder (Design Team/CHS)	CF	Paul Hebditch (CHSRA)	PH
M. Brunner (CHSRA)	MBr	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Karen Saux (PMPC/Mott MacDonald)	KS	Meghan Murphy (PMPC/AECOM)	MM

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
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RS – Response Status
ROK – response okay
BCC – Back-check comment

BRS - Back-check Response Status
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OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.001	Section 5.4, 5-4	PH	10/01/18	LEGACY Comment HSR18.015 - Permanent fencing should protect the employees of CHSR and TJPA as well as Caltrain.	10/28/21	AG	A	Revised text to read: "…and employees of Caltrain, CHSRA, and TJPA shall…"		ROK					05/04/22	CC
HSR.002	Section 5.4.1, 5-4	MBr	10/01/18	LEGACY Comment HSR18.032 - 5.4.1 Fencing Details - Fencing shall restrict thrown projectiles from impacting / hitting the sides and windshields of the trainsets and eliminate vandalism and graffiti from occurring during and after construction. Please add note to this effect, to conform with FRA safety criteria.	10/28/21	AG	A	Added note as last paragraph in Section 5.4.		ROK					05/04/22	CC
HSR.003	Section 5.5.3.3, 5-6	MBr	10/01/18	LEGACY Comment HSR18.033 - 5.5.3.3 Velocity and Freeboard - trainsets are prohibited from operating if water is over 2 inches above top of rail and at restrictive speeds.	10/28/21	AG	A	Added note as last paragraph in Section 5.5.3.3.		ROK					05/04/22	CC
Cal.001	Chapter 5 Section 5.5.3.3 (Page 5-7 of 9)	JP	06/30/22	5th bullet: omit return at end of paragraph	09/01/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.001	Chapter 5, Civil Design (Codes and Standards (third bullet)	LZ	07/04/22	In addition of the Blue Book it should also comply with the SFMTA Rail Standards in the areas of interface with Central Subway	09/01/22	MJS	A	Editorial: (Karen) we need to ensure all references (and list of references) are updated to match accordingly				11/10/22	KS	Comment addressed	11/10/22	CC
TA.002	Section 5.6.1, General Requirements (Fourth para)	LZ	07/04/22	Talks about decommissioning of MTA's OCS. Make it clear that this will only happen when single tracking, since MTA is not amenable to bus bridges	09/01/22	MJS	C	Decommissioning of Muni OCS will be permanent as the trolley lines cannot cross or come within close proximity to the DTX OCS (Muni is a DC system, DTX will be AC power). The decommissioned trolley OCS supports elecrified busses and therefore capable of bridging non-energized sections such as the proposed gap.				09/27/22	MJS	The responder (PMPC Team) clarified original commentor's confusion; this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 6
Comments Closed 6
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 06, Utilities*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Rick Bartholomew (Caltrain)	RB	Rick Bartholomew (Caltrain)	RB
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Will Spargur (PMPC/HCI)	WS	John Updike (PMPC)	JU

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GEC.001	General	MJS	11/11/21	LEGACY Comment PMPC.001 - The minimum required clearance between pavement and top of utility is likely owner-specific based on utility (electrical, gas, water, etc.). The appropriate owner-specific criterion references/resources should be identified in chapter 6.	02/28/22	MM	C	Add clause in Section 6.6 that states the minimum required clearance between pavement and top of utility is owner-specific based on the utility. (see comment in document)	04/06/22	PAR	The beginning of the chapter instructs the designer to follow guidelines of utility owner and in the absence of those follow industry standards, federal, state and local codes, standards and guidelines.	05/11/22	KS	I added the clause to section 6.6. The table lists utility-specific codes/standards, so it does not appear to conflict with the beginning of the chapter.	05/13/22	CC
Cal.001	Section 6.2	RB	10/18/18	LEGACY Comment Cal18.007 - Underground utilities should be identified to determine impact to project and a decision made to relocate or replace prior to project award.	02/28/22	MJS	A	On-going surveys are being undertaken to identify all existing underground utilities - relocation plans will need to be closely coordinated with each utility owner.				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.002	Section 6.6.7	RB	10/18/18	LEGACY Comment Cal18.008 - Section 6.6.7 Telecommunications PCJPB FOC (fiber optic cable)	02/28/22	MJS	A	Section 6.6.7 Telecommunications will be updated to include PCJPB Fiber Optic Cable (backbone)				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.003	(Page 6-3 of 3); 6.7	JP	06/30/22	last sentence, omit space after Chapter 11 ,	09/01/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.001	Section 6.1, Design and Design Responsibility (Fourth para)	LZ	07/04/22	Add "the designer must" between "indicated" and "complete" in first sentence	09/01/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.002	Section 6.7, Basement Vaults of Adjacent Buildings (First para)	LZ	07/04/22	Should state that demolition and reconstruction of basement vaults in the public right-of-way will be at the property owner's expense	09/13/22	JU	A	Added the following: ".. demolition of unpermitted vaults/basements within the public ROW will be at the property owner's expense"				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
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Total Comments 123
Comments Closed 123
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 07, Guideway Geometrics*		
Document date:	*2/28/2022*		

Reviewers

Name	Initials	Name	Initials
Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
Keith Abey (Design Team)	KA	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Hok Lai (Caltrain)	HL
Pedro C Gutierrez (Caltrain)	PCG	Joel Pancoast (Caltrain)	JP
Bin Zhang (Caltrain)	ZB	Luis Zurinaga (SF CTA)	LZ
X. Banko (CHSRA)	XB	M. Brunner (CHSRA)	MBr
James Deane (CHSRA)	JD	Douglas McCloud (CHSRA)	DMcL
Philip Gilmour (CHSRA)	PGi	Eric A. Scotson (CHSRA)	EAS
	Responders		
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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GEC.001	Chapter 07 - Guideway Geometrics	SM	03/17/22	See tracked changes and review comments in "Chapter 07_Guideway Geometrics_comments.pdf"	04/28/22	MJS	C	Incorporated into this CRL - See Comments #GEC.002 - GEC.024	08/05/22	BCC	Equation 7.4 has not been corrected.	09/01/22	MJS	Equation 7.4 (now 7.3) has been updated per comment.	09/27/22	CC
GEC.002	7.1.2, Eqn 7.1 Variable "Eu"	FB	03/18/22	Revise to read as "Eu is the maximum unbalanced superelevation, in inches."	05/09/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.003	7.1.3 - Maximum Speeds through Turnouts, bullet points	FB/CU	03/18/22	Refer to Caltrain Standards, Chapter 2 - Track, Part B Special Trackwork, Section 2.1 Speeds Through Turnouts and Crossovers	05/10/22	MJS	A	Refer to Caltrain Design Criteria, Chapter 2 - Track, Part D - Special Trackwork, Section 2.1 Speeds Through Turnouts and Crossovers. PMPC Team verified the correct reference.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.004	7.2.1 - Horizontal Alignment, ¶1-2	FB	03/18/22	Unless I missed something the only requirement to omit is if Ea1 = Ea2.	05/10/22	MJS	A	Updated subsection 7.2.3 - Spiral Curves (referenced in 7.2.1) to read as follows: "Spiral curves must be clothoids and conform to Caltrain Design Criteria Chapter 2 - Track, Part C – Track Geometry, Section 5.0 – Spirals."	08/05/22	BCC	There is nothing in the update that indicated elimination of spirals, but rather Ls (min) = 100'.	09/01/22	MJS	The first paragraph of section 7.2.3, Spiral Curves includes a statement that spirals (and the applications thereof) must conform to Caltrain design criteria (this includes the condition(s) where spirals are not necessary). No change required. The first sentence of the second paragraph "Sprial curves must have a minimum length." has been removed.	09/27/22	CC
GEC.005	7.2.1.1 Minimum Tangent Length, ¶3-1	CU	03/18/22	In reference to "absolute minimum tangent length .. 100 feet" - Not practical in this project, expect DVRs.	05/10/22	MJS	B	Caltrain criteria govern per agreement between Operators/TJPA.	8/5/2022	ROK	Design team will work with TJPA/PMPC to identify required DVRs for submission to Caltrain.				8/5/2022	CC
GEC.006	7.2.1.2 - Tangent Track Spacing	CU	03/18/22	Consolidate track spacing requirements scattered here, 7.2.5 and 7.2.7.4 into one section	05/10/22	MJS	A	Sections consolidated	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.007	7.2.1.2 - Tangent Track Spacing, Table 7-1. Minimum Tangent Track Spacing	CU	03/18/22	Regarding "Mainline track to mainline track desirable value of 16'-6" "- There is no benefit in this track spacing increase as it is not practical in this project	05/10/22	MJS	A	Revised table to show desirable track spacing of 15 ft 0 in.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.008	7.2.2 - Horizontal Curves	FB	03/18/22	In reference to : "(chord definition) may also be shown on the plans. Distances must be measured along curve arcs." - Odd Combination	05/10/22	MJS	A	Revised to read as follows: "Horizontal curves must conform with the Caltrain Design Criteria, Chapter 2 – Track, Part C – Track Geometry, subsection 3.3 – Horizontal Curves unless otherwise stipulated in this chapter."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.009	7.2.2.1 - Minimum Length of Circular Curves, ¶2-1	CU	03/18/22	In reference to "absolute minimum tangent length .. 100 feet" - Not practical in this project, expect DVRs.	05/10/22	MJS	B	Caltrain criteria govern per agreement between Operators/TJPA.	8/5/2022	ROK	Design team will work with TJPA/PMPC to identify required DVRs for submission to Caltrain.				8/5/2022	CC
GEC.010	7.2.2.2 - Minimum Radius of Curvature, Eqn #?	SM/FB	03/18/22	R = (4V^2)/e (square velocity), most agencies use (4.011V^2)/e Also note that the Eqn identifier number is missing "(7.3)"	05/10/22	MJS	B	Caltrain's Design Criteria does provide a formula for calculating a desirable minimum radius of curvature, nor does it provide an absolute minimum radius. The formula provided in the DTX Design Criteria (now 7.4) where R=(4V^2)e matches CHSRA Design Criteria Manual, Chapter 24 -Trackway Geometry (24.2.6.1 Horizontal Curves).	08/05/22	BCC	Numbering of the equations should be sequential. Numbers currently used are 7.1, 7.2, 7.4, 7.9, and 7.10. (duplicated) 7.11, 7.12, 7.14, 7.16, 7.17, and 7.18. Revise equation to show square of velocity ("V^2")	09/01/22	MJS	Editorial: Numbering/sequencing of the equations need to be updated/revised. For Chapter 7 - SL	09/27/22	CC
GEC.011	7.2.3 - Spiral Curves, Table 7-2	FB	03/18/22	The preferred and minimum equations for Minimum Segment are identical	05/10/22	MJS	A	The formulas were updated to match Caltrain's Design Criteria, Table 2-5: Length of Spiral. The formula for preferred and minimum length of spiral in twist design factor are identical. The minimum formula has been updated for Minimum Segment to Ls = 2.20V.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.012	7.2.2.2 - Minimum Radius of Curvature, ¶4-2	FB	03/18/22	Revise to read as: "Round calculated lengths of spiral curves up to the nearest 5 feet." NOTE: This will not work if designing concentric curves	05/10/22	MJS	A	Revised as noted	08/05/22	BCC	The rounding requirement seems to have been deleted.	09/01/22	MJS	The TJPA/PMPC team removed this requirement to be left to the designer's preference.	09/27/22	CC
GEC.013	7.2.2.2 - Minimum Radius of Curvature, ¶5-1	CU	03/18/22	In reference to "absolute minimum tangent length .. 100 feet" - Not practical in this project, expect DVRs.	05/10/22	MJS	B	Caltrain criteria govern per agreement between Operators/TJPA.	8/5/2022	ROK	Design team will work with TJPA/PMPC to identify required DVRs for submission to Caltrain.				8/5/2022	CC
GEC.014	7.2.6 - Track Spacing on Curves,	CU	03/18/22	Text in this section applies to tangent and curves, see comment #GEC.006	05/10/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.015	7.2.6 - Track Spacing on Curves, ¶5-1	CU	03/18/22	Delete first sentence.	05/11/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.016	7.2.7.2 - Maximum Superelevation, ¶5-1	CU	03/18/22	In reference to" ".. Range of operating speeds to ensure that the maximum allowable value for negative unbalance is not exceeded." - May not be well defined at 30%	05/11/22	MJS	C	Noted, no update necessary at this time	8/5/2022	ROK	Design team will identify changes to the design criteria that are recommended as the design level progresses.				8/5/2022	CC
GEC.017	7.2.7.4 - Track Spacing on Superelevated Curves	CU	03/18/22	See prior comment (comment # GEC.006) to consolidate track spacing requirements	05/10/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.018	7.2.10 - Turnouts, Table 7-5. Minimum Tangent Lengths at Turnouts	SM	03/18/22	Replace "note" with "not" in three of the five rows under "Absolute Value"	05/09/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.019	7.3 - Clearances	SM	03/18/22	Need to list special clearance situations such as platform edges, and walkways (emergency and maintenance) surfaces. Need required heights and offsets.	05/09/22	MJS	C	Clearances for platform edges and walkways are provided in the Minimum Horizontal Clearance table in this section.	8/5/2022	ROK					8/5/2022	CC
GEC.020	7.3.1 - Definition of Clearance Envelopes, ¶3-1	SM	03/18/22	Does this duplicate clearances accounted for in the calculation of the VDE, 1" cross-level variation?	05/09/22	MJS	A	Updated section 7.3.1 to directly parallel Caltrain's criteria Section 3.1: "On curves, to provide clearance between cars and locomotives equivalent to that obtained on adjacent tangent track, track centers shall be increased as follows: a. A minimum of 1 inch for every 30 minutes of curvature where the amount of superelevation is the same on adjacent tracks or the superelevation of the inner track is greater than that of the outer track b. A minimum of 1 inch for every 30 minutes of curvature, plus 3½ inches for every inch of difference in elevation between the two tracks where the superelevation of the outer track is greater than that of the inner track	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) will has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	8/5/2022	CC
GEC.021	7.3.4 - Adjustments to Clearances for Horizontal Curvature and Superelevation, Eqn #7.10	FB	03/18/22	Replace "Ee" with "Ea", update formula and variable list accordingly	05/09/22	MJS	A	Revised as noted (note that this has been updated to eqn # 7.18)	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.022	7.3.6 - Minimum Horizontal and Vertical Clearances, Table 7-9. Minimum Horizontal Clerance	CU	03/18/22	Update horizontal clearances for both operators on first two lines to 8' - 7" (from 9' - 3")	04/25/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.023	7.3.6 - Minimum Horizontal and Vertical Clearances, Table 7-9. Minimum Horizontal Clerance	CU	03/18/22	"Clearance to high-level walkway (more than 8" above top of rail)" - Does not apply per latest guidance	04/25/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC

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Total Comments	**123**
Comments Closed	**123**
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Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 07, Guideway Geometrics*		
Document date:	*2/28/2022*		

Reviewers

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Keith Abey (Design Team)	KA	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Hok Lai (Caltrain)	HL
Pedro C Gutierrez (Caltrain)	PCG	Joel Pancoast (Caltrain)	JP
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Philip Gilmour (CHSRA)	PGi	Eric A. Scotson (CHSRA)	EAS
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GEC.024	7.3.6 - Minimum Horizontal and Vertical Clearances, Table 7-9. Minimum Horizontal Clearance	CU	03/18/22	Revise Caltrain clearance to Track centerline to edge of level platform to 5'-8"	04/25/22	MJS	A	Revised as noted	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.025	Section 7, Codes, Standards and Guidelines, Page 7-1 of 13	CU	10/01/18	LEGACY Comment GEC18.035 - Update for latest AREMA, CHSRA and Caltrain standards.	02/28/22	AG	A	Removed years/dates to be consistent with remaining design criteria chapters.	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.026	Section 7.2.4 Reverse Curves	CU	10/01/18	LEGACY Comment GEC18.036 - 7.2.4 Reverse Curves The use of reverse curves shall generally be avoided. However, where the use of reverse curves is unavoidable, a minimum tangent distance of 100 feet shall be provided between reverses. Requirements for spiral transitions and superelevation shall be in accordance with this chapter. Expect deviation request at 4th & Townsend to allow back-to-back spirals.	02/28/22	MJS	A	Added text: "..is unavoidable, a preferred minimum tangent length between reverse curves must conform with section 7.2.8.3. The use of reverse curves shall be submitted to TJPA as a deviation request for review and approval."	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.027	7.3 Clearances, Page 7-8 of 13	CU	10/01/18	LEGACY Comment GEC18.037 - Update to incorporate latest Caltrain and CHSRA rolling-stock static and dynamic outlines.	02/28/22	MJS	A	Section 7.3 will be revised following operator approval of the draft composite vehicle clearance envelope(s).	8/5/2022	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.028	Table 7.11	KA	10/01/18	LEGACY Comment GEC18.038 - Horizontal and vertical distances do not adequately describe the stop sign shaped clearance envelope we've been using	02/28/22	MJS	A	Agreed, will negotiate option to replace with figure expressing vertical and horizontal clearances	8/5/2022	ROK	Will review future revision for consistency.	8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.029	7.3.6.1 Table 7.11	DF	10/01/18	LEGACY Comment GEC18.039 - Track Centerline to edge of platform for Caltrain (5'-7") and CHSRA (5'-9") are NOT the same. Will this create 'conflicts' with the current 3-platform face station configuration for CHSRA trains passing through Fourth & Townsend Station platforms if designed for Caltrain service only?	02/28/22	AG	B	Correction: Caltrain = 5'-4". Design should consider more restrictive of both Caltrain and CHSRA. If platforms are designated for each operator, both requirements should be listed.	8/5/2022	ROK	Caltrain to Track CL is now 5'-8"; CHSR to Track CL is now 6'-0"				8/5/2022	CC
GEC.030	7.2.1 Horizontal Alignment	SM	06/14/22	(Second sentence in first Paragraph) Since there are no conditions described in 7.2.3 consider omitting sentence since they are described in referenced Caltrain criteria.	09/01/22	MJS	A	Sentence removed from section 7.2.1. Section 7.2.3 refers to Caltrain DCM which states "Spirals are not required for curves less than 30 minutes for MAS under 20mph, or on curve that is part of a turnout; however, a minimum curve length of 100 feet shall be implemented. Additionally, all curves, including such curves, shall have a minimum 1/2 inch actual superelevation."				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
GEC.031	7.2.1.1 Minimum Tangent Length	CU	07/01/22	(Second sentence after Eqn 7.2) Reconcile with bumper language	09/01/22	MJS	A	Revised as noted				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
GEC.032	7.2.2.2 Minimum Radius of Curvature	SM	06/14/22	Correct formula: R=(4V^2)/e (formula not numbered)	09/01/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
GEC.033	7.2.8.5 Combined Horizontal and Vertical Curvature	CU	07/07/22	Eliminate legacy criteria. It is impossible to avoid major overlaps on this project due to right-of-way constraints and Caltrain criteria has no restriction	09/01/22	MJS	DE	DTX DCM states "Avoid overlapping.." - it does not prohibit. Caltrain criteria governs. Will add "where feasible".				10/10/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/10/22	CC
GEC.034	7.3.5.1 to 7.3.6 (Table 7.8 to 7.11 references	HK	08/03/22	Table references for Table 7.8 to 7.11 are incorrectly noted in the body of the text from sections 7.3.5.1 to 7.3.6.	09/01/22	KS	A	Editorial: Please ensure formulas, table #, figure #, and references are updated. Updated noted table issues AND **added table 7.9 to TOC.**				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
GEC.035	7.3.6 Minimum Horizontal and Vertical Clearances	CU	07/12/22	Restore "Table 7-9: Minimum Horizontal Clearance" (line item "Track centerline to face of tunnel station wall (conditions where no walkway exists") to account for legacy condition at Transit Center where there is no provision for side walkways opposite Caltrain platforms	09/01/22	MJS	A	Returned line item to table though the old clearnace for the existing STC design/condition still states 7'-3"				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
GEC.036	7.3.6 Minimum Horizontal and Vertical Clearances	CU	07/12/22	Restore missing footnote: "*Dimensions for infrastructure assest must be verified against CPUC GO-26-D clearances."	09/01/22	MJS	A	Revised as noted, added following footnote: "Clearance dimensions for infrastructure assets must be verified against CPUC GO-26D clearances once CHSRA rolling stock is identified.				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**123**
Comments Closed	**123**
% Complete	**100%**

Document Control File Code:

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 07, Guideway Geometrics*		
Document date:	*2/28/2022*		

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Cal.001	Chapter 7 Section 7.1.1	PCG	03/21/22	Specify limits and speeds - Currently between MP 0.47 and MP 1.13 the speeds vary between 35 and 40 MPH	05/10/22	MJS	A	The final track design will ultimately dictate maximum authorized speeds (MAS) along the alignment. Currently, at the preliminary engineering level, the stationing at which MAS is reduced is subject to change. The next iteration of the DTX Design Criteria may include a table with stationing limits of speed restrictions (5 mph increments). The section has been modified to read as follows: "The maximum authorized speed for passenger trains within the limits of the project, at-grade and below-grade tracks varies between 20 mph and 40 mph. The maximum authorized speed for trains approaching the Fourth and King Street Station between Caltrain mileposts 0.2 and 0.7 currently varies between 20 mph and 40 mph."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.002	Chapter 7 Section 7.1.1	PCG	03/21/22	The authorized train speeds between 4th and King MP 0.2 and MP 0.7 vary between 20 and 40 MPH	05/10/22	MJS	A	See response to comment Cal.001	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.003	Chapter 7 Section 7.1.3	PCG	03/21/22	Remove No. 11 and No. 15 turnouts, they are not Caltrain standard turnouts	05/10/22	MJS	A	Revised section 7.1.3 to read as follows: "The design speeds for passenger trains through turnouts are based on tangent point geometry and a maximum unbalanced superelevation of 3 inches. Refer to the Caltrain Design Criteria, Chapter 2 – Track – Track, Part D – Special Trackwork for maximum operating speed through turnouts."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.004	Chapter 7 Section 7.2.1	PCG	03/21/22	change/remove strikeout to reference section 7.2.3 Spiral curves	05/10/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.005	Chapter 7 Section 7.2.1.2	PCG	03/21/22	In table 7-1, we are saying that absolute value is 14 ft 6 in. , and in the sentence below we have 15' as the minimum	05/10/22	MJS	A	Removed sentence below Table 7-1	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.006	Chapter 7 Section 7.2.7	PCG	03/21/22	Will there be any station platforms on curves? If so there may be a need to superelevate track if the degree of curve is greater than 3 degree, other consideration will be passenger car tilt and clearance to the platform	05/10/22	MJS	C	No, the tracks at the Fourth and Townsend Street Station and Salesforce Transit Center will be tangent with the exception of track T-26 in the transit center, however, that platform face will be tapered.	05/13/22	ROK					05/13/22	CC
Cal.007	Chapter 7 Section 7.2.7.1	PCG	03/21/22	we are specifying a minimum of 0.5" superelevation for any curve, contradicts previous specification 7.2.7 requirement on station platforms (if any will be within a platform)	05/10/22	MJS	C	Section 7.2.7.1 is a subsection to 7.2.7, therefore the statement in 7.2.7.1 "For any curve, a minimum of 0.5 of superelevation must be specified." applies to all other conditions not listed in 7.2.7. Also, 1/2" for any curve is the language used in Caltrain Design Criteria 2.C.4.2.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.008	Chapter 7 Section 7.2.7.2	PCG	03/21/22	Table 7-3. Question as to why we are specifying 2 in Eu as the desirable Value and not 3 in Eu?	05/10/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.009	Chapter 7 Section 7.2.7.2	PCG	03/21/22	Second to last paragraph - Spiral and Geometric exception for curves in platforms - see previous comments on curves within station platforms	05/10/22	MJS	A	Sentence removed/deleted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.010	Chapter 7 Section 7.2.7.4	PCG	03/21/22	Remove this section or refer to section 7.2.6	05/10/22	MJS	A	Sections 7.2.6 and 7.2.7.4 will be moved as subsection to "7.2.1.2 Track Spacing" 7.2.1.2.1 Track Spacing – Tangent Track (currently 7.2.1.2) 7.2.1.2.2 Track Spacing on Curves (currently 7.2.6) 7.2.1.2.3 Track Spacing on Superelevated Curves (currently 7.2.7.4)	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.011	Chapter 7 Section 7.2.9.4	PCG	03/21/22	Are we not contradicting section 7.2.5?	05/10/22	MJS	C	No, section 7.2.5 allows for horizontal compound circular curves whereas section 7.2.9.4 is referring to compound vertical curves (not allowed).				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.012	Chapter 7 Section 7.2.10	PCG	03/21/22	second paragraph - change Table 7.54 to Table 7.45 or whatever table number will be used since Table 7.45 is striked out	05/10/22	MJS	A	Revised, update table name is Table 7-5	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.013	Chapter 7 Section 7.2.10	PCG	03/21/22	Table 7.45 - "Between point of switch of turnout" we have an Absolute value of "20' (tangent length will not be less than the length of the stock rail projection)" - here it is 20' below we are saying the length of the stock rail projection is 15'. Need to be consistent with what is the length of the stock rail projection?	05/10/22	MJS	B	This data is copied directly from Caltrain Design Criteria (Third Edition), Chapter 2 Track, Part C - Track Geometry, subsection 3.3 - Tangent; Table 2-2: Minimum Tangent Length (Main Tracks).				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.014	Chapter 7 Section 7.2.10	PCG	03/21/22	Table 7.45 - In a couple of items we are also referencing the length of the stock rail projection, but we change the distance to 15', what is the stock rail projection distance or specify a consistent distance for all	05/10/22	MJS	B	See response to comment Cal.013				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.015	Chapter 7 Section 7.3.5.1	PCG	03/21/22	Table 7-8 - Change tolerances to +- 0.125 for Ballasted and Direct Fixation track	05/10/22	MJS	DE	PMPC has evaluated and discussed internally, we do not believe that 1/8" is feasible for this type of construction work.				05/16/22	MM	The responder (PMPC Team) has confirmed that the criteria is correct as stated; no Caltrain criteria is available for this item; therefore this comment is considered closed.	05/16/22	CC
Cal.016	Section 7.2.1	HL	10/18/18	LEGACY Comment Cal18.009 - "..the conditions described in Section 7.2.3 are met." Spiral curves should always be used when there are actual superelevation.	02/28/22	MJS	A	Section 7.2.3 states: "Spiral, easement, or transition curves will be used between horizontal tangents and circular curves and between compound curves. Spiral curves will be clothoids. Spiral curves will be required wherever there is a change in actual superelevation and are desirable even when there is no actual superelevation."				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.017	Section 7.2.3	HL	10/18/18	LEGACY Comment Cal18.010 - Equation (7.4) under section 7.2.3 Spiral Curves which describes the desirable minimum length of a spiral curve: Please justify and provide reference for this criteria	02/28/22	MJS	A	Replaced formulas with table Caltrain Design Criteria (third edition, dated August 31, 2020), Chapter 2 - Track, Table 2-5: Length of Spiral				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC

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Downtown Rail Extension (DTX)
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% Complete 100%

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
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Cal.018	Section 7.2.3	HL	10/18/18	LEGACY Comment Cal18.011 - (Clouded text) "Spiral curves are not required where the minimum calculated length of the spiral curve derived from equations 7.4 and 7.5 divided by the radius of curvature is less than 0.01." Please justify and provide reference for this criteria	02/28/22	MJS	A	Replaced formulas with table Caltrain Design Criteria (third edition, dated August 31, 2020), Chapter 2 - Track, Table 2-5: Length of Spiral				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.019	Section 7.2.4	HL	10/18/18	LEGACY Comment Cal18.012 - "..a minimum tangent distance of 100 feet shall.." The minimum tangent distance should be the greater of 3V or 100 feet	02/28/22	MJS	A	Revised to read as follows: "The use of reverse curves will generally be avoided. However, where the use of reverse curves is unavoidable, the minimum tangent length between reverse curves must conform with section 7.2.8.3."				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.020	Section 7.2.7	HL	10/18/18	LEGACY Comment Cal18.013 - (Clouded text) "Superelevation shall be varied uniformly along the length of the spiral curve. Where the condition for no spirals is met, the superelevation transition shall be developed over the calculated length of spiral, equally on either side of the point of curvature." Spiral curves should always be used when there are actual superelevation.	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-16 & Figure 2-2]: "Spirals are not required for curves less than 30 minutes for MAS under 20 mph, or on curve that is part of a turnout; however, a minimum curve length of 100 feet shall be implemented. Additionally, all curves, including such curves, shall have a minimum 1/2" actual superelevation.." Removed second sentence				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.021	Section 7.2.7.2	HL	10/18/18	LEGACY Comment Cal18.014 - (Clouded text) "Superelevation shall be checked against the range of operating speeds to ensure that the maximum allowable negative unbalance is not exceeded." Negative unbalance should be avoided as much as possible.	02/28/22	MJS	B	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-18 & Table 2-5]: Table 2-5 dictates minimum unbalance as Ls=1.22EuV Section 7.2.7.3 Minimum Superelevation states "the minimum unbalanced superelevation will be 1.0 inch, except for when the actual superelevation plus the unbalanced superelevation is less than 2.0 inches."				05/10/22	MJS	PMPC misinterpreted original comment. Table 7-3 revised (third row of data deleted "minimum negative unbalance for slowest operating train"). New sentence added: "Negative unbalance will be avoided."	05/10/22	CC
Cal.022	Section 7.2.9.2	HL	10/18/18	LEGACY Comment Cal18.015 - "The minimum radius of vertical curve shall be 2,000 feet." Include formula to determine the radius for checking	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Section 7.2 VERTICAL CURVES, pps 2-20, 2-21, Figure 2-3]: "Vertical curves shall be designed in accordance with the requirements for high-speed main tracks and shooflies, as recommended in AREMA Manual for Railway engineering shown in the following formula:." There is no formula from Caltrain's design criteria to solve for radius, the section was updated to conform with Caltrain.				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.023	Section 7.3.1.2 Table 7.6	HL	10/18/18	LEGACY Comment Cal18.016 - Table 7.6, Vehicle Dynamic Outline - Car Body Movements (line items 2-4) The assumed track deviations are low. Please refer to FRA part 213 for their limits based on appropriate class of track.	02/28/22	MJS	DE	FRA Part 213.307 - Classes of track: Operating speed limits defines Class 6 track as maximum allowable speed 110mph. Class 6 track prescribes the following maximum values for deviations/variations: Track cross level deviation: Gauge variation: Alignment deviation:				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.024	Section 7.3.1.2 Table 7.6	HL	10/18/18	LEGACY Comment Cal18.017 - Table 7.6, Vehicle Dynamic Outline - Car Body Movements (line 6 "Wheel-rail clearance" - 0.25 in.) Please confirm this number is correct	02/28/22	MJS	DE	Section to be updated with operator-approved composite clearance envelope(s).				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.025	Section 7.3.2	HL	10/18/18	LEGACY Comment Cal18.018 - (Clouded text) "..but may project over the top of the walkway envelope." Please define or provide reference of this walkway envelope	02/28/22	MJS	C	NFPA 130, Section 6.3.2.1, defines and governs the minimum dimensions of emergency egress route walkway as follows: "The means of egress within the trainway shall be provided with an unobstructed clear width graduating from 610mm (24") at the walking surface to 760mm (30") at 1575mm (62") above the walking surface to 430mm (17") at 2025mm (80") above the walking surface."				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with relevant criteria; therefore this comment is considered closed.	05/13/22	CC
Cal.026	Section 7.3.6.1 Table 7.11	HL	10/18/18	LEGACY Comment Cal18.019 - Table 7.11, Minimum Horizontal Clearance (line items 1-2, under "Caltrain" currently states 8 ft 3 in.) CPUC requirement is 8'-6"	02/28/22	MJS	A	CPUC GO 26-D, Section 3 - Side Clearances, under subsection 3.2 states the following: "All structures and obstructions above the top of the rail except those hereinafter specifically mentioned.. 8'-6". NOTE: Posts, pipes, warning signs, and similar obstructions should, where practicable, have a side clearance of ten (10) feet." Updated to 9'-3" per CAHSR FI agreement				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.027	Section 7.3.6.1 Table 7.11	ZB	10/18/18	LEGACY Comment Cal18.020 - Table 7.11, Minimum Horizontal Clearance (line item 1 "Track centerline to face of tunnel wall, signal, or OCS poles") A minimum horizontal clearance of 10'-0" from TCL to face of permanent structure is required by Electrification Design Criteria.	02/28/22	MJS	A	CPUC GO 26-D, Section 3 - Side Clearances, under subsection 3.2 states the following: "All structures and obstructions above the top of the rail except those hereinafter specifically mentioned.. 8'-6". NOTE: Posts, pipes, warning signs, and similar obstructions should, where practicable, have a side clearance of ten (10) feet." Updated to 9'-3" per CAHSR FI agreement				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
Cal.028	Section 7.3.6.1 Table 7.11	ZB	10/18/18	LEGACY Comment Cal18.021 - Table 7.11, Minimum Horizontal Clearance (line item 2 "Track centerline to at-grade signal and OCS poles") A minimum horizontal clearance of 9'-3" from TCL to face of pole is required by Electrification Design Criteria.	02/28/22	MJS	A	CPUC GO 26-D, Section 3 - Side Clearances, under subsection 3.2 states the following: "All structures and obstructions above the top of the rail except those hereinafter specifically mentioned.. 8'-6". NOTE: Posts, pipes, warning signs, and similar obstructions should, where practicable, have a side clearance of ten (10) feet." Updated to 9'-3" per CAHSR FI agreement				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.029	Section 7.3.6.1 Table 7.11	ZB	10/18/18	LEGACY Comment Cal18.022 - Table 7.11, Minimum Horizontal Clearance (line item 3 "Track centerline to face of tunnel/station wall (condition where no walkway") This needs to be revisited once the comments above are addressed.	02/28/22	MJS	A	There is no condition where a walkway is not present, removed line				05/10/22	MJS	The responder (PMPC Team) agreed to update per original comment to be consistent with Caltrain Design Criteria. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/10/22	CC
Cal.030	Chapter 7 Section 7.1.2; (Page 7-2 of 15)	PCG	06/17/22	Maximum Speeds on Curves: What is the approved maximum cant deficiency of the new Caltrain Stadler fleet and of the CHSR fleet?	09/01/22	MJS	C	The geometry requirements are defined by Caltrain Design Criteria (Max. 3" unbalanced superelevation.				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
Cal.031	Chapter 7, Section 7.2.6.2: (Page 7-6 of 15)	JP	06/30/22	Add sentence to end of section; 'Unbalanced superelevation that exceeds 3 inches must be justified by analysis for vehicle type and submitted to FRA by designer for approval.' From the latest task 337.2.1 Track_Draft Plans (TR-3104, 3107 and 3108), it shows more than 3 inches of Eu.	09/01/22	MJS	C	Design Team to address DTX track design unbalance for curve MT2-11 (Eu = 3.03). Future PAX tracks (by others) have 4.5"+ of unbalance (speeds not yet determined. No change to DTX Design Criteria required.				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
Cal.032	Chapter 7, Section 7.3.1.2; (Page 7-14 of 15)	BZ	06/30/22	Table 7.6, Vehicle Dynamic Outline - Car Body Movements (line 6 "Wheel-rail clearance" - 0.25 in.) Please confirm this number is correct	09/01/22	MJS	A	Added a clause/condition under Table 7.6: "* The values presented for magnitude in Table 7.6 are subject to change once CHSRA has selected their train manufacturer."				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
Cal.033	Chapter 7, Section 7.3.5.1; (Page 7-14 of 15)	JP	06/30/22	revise 'Table 7-7' to Table 7.8	09/01/22	MJS	A	Editorial: Tables, figures, equations, and all cross-references will be reviewed and updated as required.				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC
Cal.034	Chapter 7, Section 7.3.5.1; (Page 7-14 of 15)	BZ	06/30/22	Table 7-8 - Change tolerances to +- 0.125 for Ballasted and Direct Fixation track. Refer to Caltrain Specs 20400 for track constuction tolerance.	09/01/22	MJS	C	Caltrain track construction tolerance requirement for ballasted track is 0.5" (vertical and horizontal). The DTX Design Criteria may need to be updated once Caltrain publishes updated Caltrain Standard Specifications (end of 2020)				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC
Cal.035	Chapter 7, Section 7.3.5.2; (Page 7-14 of 15)	JP	06/30/22	revise 'Table 7-8' to Table 7.9	09/01/22	MJS	A	Editorial: Tables, figures, equations, and all cross-references will be reviewed and updated as required.				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC
Cal.036	Chapter 7, Section 7.3.6; (Page 7-15 of 15)	JP	06/30/22	revise 'Table 7-9' to Table 7.10 revise 'Table 7-10' to Table 7.11	09/01/22	MJS	A	Editorial: Tables, figures, equations, and all cross-references will be reviewed and updated as required.				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC
Cal.037	Chapter 7, Section 7.3.6; (Page 7-15 of 15)	BZ	06/30/22	Table 7.10: Minimum Horizontal Clearance: What the "*" is noted for?	09/01/22	MJS	A	It was a reference to a footnote that was accidentally deleted (now included): "Clearance dimensions for infrastructure assets must be verified against CPUC GO-26D clearances once CHSRA rolling stock is identified.				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 123
Comments Closed 123
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 07, Guideway Geometrics*		
Document date:	*2/28/2022*		

Reviewers

Name	Initials	Name	Initials
Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
Keith Abey (Design Team)	KA	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Hok Lai (Caltrain)	HL
Pedro C Gutierrez (Caltrain)	PCG	Joel Pancoast (Caltrain)	JP
Bin Zhang (Caltrain)	ZB	Luis Zurinaga (SF CTA)	LZ
X. Banko (CHSRA)	XB	M. Brunner (CHSRA)	MBr
James Deane (CHSRA)	JD	Douglas McCloud (CHSRA)	DMcL
Philip Gilmour (CHSRA)	PGi	Eric A. Scotson (CHSRA)	EAS
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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HSR.001	All references	DMcL	03/15/22	Is the use of the word 'must' correct in this document	05/10/22	MJS	C	The TJPA/PMPC Team have agreed upon using the imperatives for the DTX Design Criteria Revision Book 02.				05/13/22	MM	The responder (PMPC Team) has determined that the language is consistent with project standards.	05/13/22	CC
HSR.002	All references	DMcL	03/16/22	The abbreviation for California High Speed Rail should be CAHSR. Please amend accordingly.	05/10/22	MJS	B	"CHSRA" stands for California High-Speed Rail Authority, i.e., the state authority, in all instances in this chapter. The program generally does not abbreviate the term "California high-speed rail"				05/13/22	MM	The responder (PMPC Team) has determined that the language is consistent with project standards.	05/13/22	CC
HSR.003	subheading 7.1	DMcL	03/16/22	Design speeds should be rounded down to the nearest 5mph, AFFECTS: Caltrain	05/10/22	MJS	A	Revised sentence to read as follows: "Round down calculated design speeds to the nearest increment of 5 mph."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.004	subheading 7.1.2	DMcL	03/16/22	In agreement that the formula quoted calculates the maximum speed achievable on a curve, however there doesn't seem to be a formula for calculating the Equilibrium Superelevation from which the design superelevation, unbalance and spiral lengths can be calculated AFFECTS: Caltrain and CHSRA	05/10/22	MJS	C	This equation is already provided, see formula (7.9) in section 7.2.7.1 - Calculation of Superelevation.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.005	subheading 7.2.7.2	DMcL	03/16/22	Where have the all the values for superelevation in Table 7-3 been taken from as there is no mention of these in the Caltrain Design Criteria, Chapter 2 - Track AFFECTS: Caltrain	05/10/22	MJS	DE	DTX Design Criteria REV 01, released in 2009 and reviewed by the Operators in 2016/2018 included Table 7-3 - Maximum Superelevation. Absolute maximum values for actual (5 in) and unbalanced superelevation (3 in) are stated in the Caltrain Design Criteria, Chapter 2 - Track, Part C - Track, subsections 4.0-4.2. Desirable values for actual (currently 4 in) and unbalanced superelevation (currently 3 in) were updated based on Caltrain comments. The "Maximum negative unbalance for slowest operating speed on curve" line has been removed and a sentence added after the table noting that negative unbalance will be avoided.	06/27/22	BCC	In October 2018 a Basis of Design Memo was approved by Caltrain and CAHSR which amended the Caltrain Design Criteria in Sections 1, 4 1nd 5.2. These amendments should be used between San Francisco to South of CP Lick. I would have thought these should also form part of the DTX Project as it is on the Caltrain ROW. If these were not issued it will need confirmation that these have not to be used and highlighted accordingly (I do note that the maximum superelevation in the 2020 version of the Caltrain Design Criteria is quoted as 5 inches)	10/07/22	MJS	The responder (PMPC Team) has reviewed the backcheck comment provided by CHSRA and reviewed the 2018 Basis of Design Memo. Given the proposed MAS for the project limits and lack of agreement between TJPA regarding applicability to the DTX project, this comment will remain unchanged for this version of the DTX Design Criteria (living project document). The PMPC Team agrees to carry forward this concept/conflict for further discussion and resolution in the next phase of design.	10/07/22	CC
HSR.006	subheading 7.2.7.2	DMcL	03/16/22	There is the mention of a spiral transition curve, not aware that the element is called that in the railroad industry, either a spiral or transition should suffice. AFFECTS: Caltrain and CHSRA	05/10/22	MJS	A	Revised all references to "spiral curves"	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.007	subheading 7.2.1	DMcL	03/16/22	The minimum tangent length should be tabulated similar to the Caltrain Design Criteria, table 2-2 for ease of reading AFFECTS: Caltrain	05/10/22	MJS	C	Table 7-5 - Minimum Tangent Length at Turnouts (section 7.2.10 Turnouts)				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.008	subheading 7.2.1.1	DMcL	03/16/22	Where have the values in Table 7-1 come from as the track center distances for the main line on tangent track is 15 feet, my understanding was that the Caltrain standards were being used for track center to center dimensions. AFFECTS: Caltrain	05/10/22	MJS	B	Table 7-1 - Minimum Tangent Track Spacing is based on previous agreement with Caltrain during the development of the DTX Design Criteria. The PMPC and Design teams have both confirmed that the spacing is compliant with CPUC General Order 26-D.	06/27/22	BCC	Please supply evidence of this agreement to CAHSR RDP team for our records	10/06/22	MJS	The desirable values are taken from Caltrain Design Criteria (2-C.3.1), Absolute minimum for mainline to mainline is from DVR0010. The responder (PMPC Team) provided the source material requested therefore this comment is considered closed.	10/06/22	CC
HSR.009	subheading 7.2.1.2	DMcL	03/16/22	Is the last sentence in this section required as tangent track is not curved nor superelevated. AFFECTS: Caltrain	05/10/22	MJS	A	Revised to read as follows: "Track spacing must be adjusted to account for track curvature.."				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.010	subheading 7.2.2	DMcL	03/16/22	Throughout the document to date the radii of curves are specified as Degree of Curvature. The Design Criteria should pick on method of measurement for radii and adjust accordingly AFFECTS: Caltrain	05/10/22	MJS	B	Degree of curvature and radius of curve are easily converted and are typically both provided on track design plans. Caltrain Design Criteria expresses both as variables in formulas.	06/27/22	BCC	Caltrain Design Criteria, 3.3.2 states that the circular or simple curve shall be defined by its degree of curvature. Please amend accordingly	10/06/22	MJS	The following has been added to section 7.2.2: "Circular curves for track geometry will be defined by radius and equivalent degree of curvature (Dc)." The DTX Design Criteria will prioritize radius of curve but require track geometry to include radius of curvature. This comment is considered closed.	10/06/22	CC
HSR.011	subheading 7.2.2.1	DMcL	03/16/22	Where has the formula for minimum length of curve been taken from, but the 100 feet mentioned after is acceptable AFFECTS: Not in Caltrain	05/10/22	MJS	A	Formula 7.3 removed as there is no tie to source from either Caltrain or CHSRA criteria.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.012	subheading 7.2.2.2	DMcL	03/16/22	Agree with the formula for calculating the minimum radius of curve, however the absolute minimum radius of curvature is less than the 650 feet quoted due to the similar flexure turnout being placed on the 650 feet radius. This section needs rewording if it applies to the main line explaining the reason why AFFECTS: Caltrain and CHSRA	05/18/22	MM	A	Section has been updated to reflect that 650 ft minimum is for mainline tracks and 500 ft minimum is for Caltrain-only tracks. The curved crossover on the 650 radius cited in the comment allows access to a Caltrain platform and is therefore for Caltrain-only use.				05/18/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/18/22	CC
HSR.013	subheading 7.2.3	DMcL	03/16/22	No mention in the Caltrain Design Criteria that the minimum length of spiral must be 100 feet AFFECTS: Not in Caltrain	05/10/22	MJS	C	Caltrain Design Criteria, Chapter 2, Part C, Section 5.1 Application of Spirals: "..however, a minimum curve length of 100 feet shall be implemented."	06/27/22	BCC	My understanding for the 100 feet quoted in Section 5.1 is that this is when a circular curve is used instead of a clothoid spiral. It just so happens to confirm the minimum length of circular curve	10/06/22	MJS	The responder (PMPC Team) met with Caltrain for a CRM on chapters 7 and 8 where this topic was discussed. Caltrain is satisfied with the existing language - no change required. This comment is considered closed.	10/06/22	CC
HSR.014	subheading 7.2.7.1	DMcL	03/16/22	The formula is for Equilibrium Superelevation (cant plus cant deficiency), not superelevation (cant). Cant is what will be applied to the track with the remainder being unbalance (cant deficiency). This is quite correctly shown later	05/13/22	MM	A	Reviewer is correct, formula has been updated.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.015	subheading 7.2.7.2	DMcL	03/16/22	Table 7-3, where have these values come from. Also the subheading needs to be looked at again and rewritten where appropriate e.g. curves on platforms !. Design speed is not based on a maximum unbalance of 3", this is just one of the factors used for calculating the maximum speed on a curve. AFFECTS: Not in Caltrain	05/10/22	MJS	A	See comment response to #HSR.005 for first part of comment. Deleted sentence "Design speed must be based on a maximum unbalanced superelevation of 3 inches."				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 123
Comments Closed 123
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 07, Guideway Geometrics*		
Document date:	*2/28/2022*		

Reviewers

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Keith Abey (Design Team)	KA	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Hok Lai (Caltrain)	HL
Pedro C Gutierrez (Caltrain)	PCG	Joel Pancoast (Caltrain)	JP
Bin Zhang (Caltrain)	ZB	Luis Zurinaga (SF CTA)	LZ
X. Banko (CHSRA)	XB	M. Brunner (CHSRA)	MBr
James Deane (CHSRA)	JD	Douglas McCloud (CHSRA)	DMcL
Philip Gilmour (CHSRA)	PGi	Eric A. Scotson (CHSRA)	EAS
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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HSR.016	subheading 7.2.8.1	DMcL	03/16/22	Is the formula shown the same as contained within the Caltrain Design Criteria, section 7.1 AFFECTS: Not in Caltrain	05/10/22	MJS	A	Updated formula (7.10) to match Caltrain Design Criteria; revised to read as follows: "Maximum design gradient, with curve compensation at 0.04 percent per degree of curve, if applicable, for grade up to maximum gradient (Gc) as follows: (7.10) Gc = G – 0.04Dc Where: Gc is the maximum gradient as a percentage. G is the gradient before as a percentage. Dc is the degree of vertical curvature in decimal degrees."				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.017	subheading 7.2.8.3	DMcL	03/16/22	this subheading should have a different heading -e.g. Grade	05/10/22	MJS	A	Revised subheading "7.2.8.3 Minimum Length of Gradient". Also updated references from "vertical tangent" to "vertical gradient".	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.018	subheading 7.2.9.1	DMcL	03/16/22	Where have all the formulae come from. The Caltrain Design Criteria just has the first one : L = (D*V^2*K/A)	05/10/22	MJS	C	Caltrain criteria does not have a minimum vertical curve length requirement. However, high-speed rail TM 2.1.2 provided minimum and desirable vertical curve lengths which were used for this DTX Design Criteria.	06/27/22	BCC	Section 7.2 of the Caltrain Design Criteria states …least the length of a vertical curve be less than 100 feet	10/06/22	MJS	The responder (PMPC Team) recognizes this oversight and has replaced the absolute minimum length of a vertical curve equations with 100 feet. This comment is considered closed.	10/06/22	CC
HSR.019	subheading 7.2.9.2	DMcL	03/16/22	The formula mentioned here has already been mentioned in the previous subheading, can this whole subheading be removed	05/13/22	MM	C	Previous section includes an equation for minimum length of curve, this section is for minimum radius.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.020	subheading 7.2.9.5	DMcL	03/16/22	The first paragraph seems similar to what is used in the TM for CAHSR for segments. Is this subheading actually required bearing in mind the location of the project	05/13/22	MM	C	Yes, the DTX project has complex geometry given the number of physical constraints in the urban core.				05/13/22	MM	The responder (PMPC Team) has determined that the language is consistent with project standards.	05/13/22	CC
HSR.021	subheading 7.2.10	DMcL	03/16/22	This subheading should be revisited and factually written , why not take the wording from the Caltrain Design Criteria.	05/10/22	MJS	A	Table has been updated based on Caltrain criteria Chapter 2, Table 2-2.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.022	subheading 7.3.1.2	DMcL	03/16/22	The Cross section and table would be better served on the same page	05/10/22	MJS	A	Revised as noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.023	Section 7.3.1.3	DMcL	03/16/22	Why not combine both sections	05/10/22	MJS	A	Agree, removed heading for Section 7.3.1.3.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.024	Section 7.3.5.2	DMcL	03/16/22	Where have the figures in Table 7-8 come from. Are the tolerances construction tolerances	05/10/22	MJS	A	Agree, table has been removed.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.025	Section 7.3.6	DMcL	03/16/22	The clearances in Table 7-9 don't seem correct although the 6'0" dimension is currently being used, but this may change once the CAHSR trainset is known AFFECTS: CHSRA	05/10/22	MJS	A	Table updated.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.026	Table 7-10	DMcL	03/16/22	Table 7-10, should the vertical distance to the tunnel crown not be 24' 6" same as the overhead structure AFFECTS: CHSRA	05/13/22	MM	A	Table updated.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.027	Chapter 7 General	DMcL	03/16/22	There is no mention of a continuous check rail (restraining rails) for the tight radius curve of 650 feet radius. From a study I have read it would seem that in the US they are using 500 feet and below, however there are times when greater than 500 feet they have been used. As we do not know what trainset CAHSR will be adopting I feel that an allowance should be made for the use of these. AFFECTS: CHSRA	05/18/22	MM	C	Guard rail criteria can be found in Chapter 8. The current design includes guard rails on the 650 ft radius curves.	06/27/22	BCC	In this comment I am discussing continuous check rails (restraining rails) which are in place to stop derailments on tight radius curve. As the 650 feet radius is on the approach to station platforms it may be worthwhile consdering having these in place	09/01/22	MJS	The responder (PMPC Team) agrees to investigate including tight curve restrainting rail requirements in the next version of the DTX Design Criteria (living project document). Restraining rails have been added to the PE design on tight radius curves.	10/07/22	CC
HSR.028	Chapter 7 General	DMcL	03/16/22	I cannot find anywhere that it quotes the minimum radius for using CWR. Is the designer satisfied that CWR can be installed on the 650 feet radius curve. AFFECTS: CHSRA	05/18/22	MM	C	The design team has experience using CWR on track as tight as 82' radius. The rail would need to be pre-bent before installation for radii less than 500'.							05/18/22	CC
HSR.029	Chapter 7 General	DMcL	03/16/22	As the crossovers on the 650 feet radius curve are likely to have an equivalent turnout radius less than the CAHSR trainset can use it would make sense that a paragraph is added into the design criteria highlighting this, AFFECTS: CHSRA	05/18/22	MM	A	Text has been updated to reflect that 650 ft minimum is for mainline tracks and 500 ft minimum is for Caltrain-only tracks. The curved crossover on the 650 radius cited in the comment allows access to a Caltrain platform and is therefore for Caltrain-only use.				05/18/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/18/22	CC
HSR.030	CAHSR/PG/001	PGi	07/03/22	Sec 7.2.1.2 -Tangent Track Spacing - Values in table do not match values in preceding paragraph for spacing between mainline tracks.	05/10/22	MJS	A	Revised as noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.031	CAHSR/PG/002	PGi	07/03/22	Table 7-10 - minimum horizontal clearances need to be listed separately for each infrastructure asset. Currently lists one horizontal value for tunnel walls, signal and OCS structure. These distances can differ.	05/10/22	MJS	B	A note has been added to the table that minimum horizontal clearances to each of these assets must be verified against CPUC GO 26-D clearances.	06/22/22	BCC	I disagree with the response and the change to refer to CPUC GO 26D clearances. Clearances in some instances differ to CPUC directive clearances and should be explicitly stated in the DCM to ensure no ambiguity for the civils contractor. To list clearances required to each infrastructure sub-set is not a big task	09/01/22	MJS	The responder (PMPC Team) agrees to provide clearances for the following conditions to match those provided in CHSRA Design Criteria Rev. 5. Therefore this comment is considered closed. Centerline of track to face of permanent structure (tunnel and at-grade) Centerline of track to face of fixed equipment (tunnel and at-grade) Centerline of track to edge of platform	10/12/22	CC

Transbay Program
Downtown Rail Extension (DTX)
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Total Comments 123
Comments Closed 123
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 07, Guideway Geometrics*		
Document date:	*2/28/2022*		

Reviewers

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Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
Keith Abey (Design Team)	KA	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Hok Lai (Caltrain)	HL
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X. Banko (CHSRA)	XB	M. Brunner (CHSRA)	MBr
James Deane (CHSRA)	JD	Douglas McCloud (CHSRA)	DMcL
Philip Gilmour (CHSRA)	PGi	Eric A. Scotson (CHSRA)	EAS
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HSR.032	CAHSR/PG/003	PGi	07/03/22	Table 7-10 - the listed minimum horizontal clearance for CAHSR is 9ft3in this is incorrect. Please advise where this figure was derived.	05/10/22	MJS	A	Revised to 8 ft 7 in.	06/22/22	BCC	The DCM has been revised to show a horizontal offset from track CL to tunnel wall as 8ft 7in, this is still incorrect. The minimum horizontal clearance for CHSR is 10ft 8in. This figure has been listed incorrectly on 2 occasions and I would ask where these figures are being derived.	10/12/22	MJS	The values provided in the DTX criteria for minimum horizontal clearances are derived from CPUC GO 26-D, Section 9, which states the following: "9.2 Minimum side clearances of railroad and street railroad tracks which are not used or proposed to be used for transporting freight cars shall be thirty (30) inches from the side of the widest equipment operated, except that for poles support trolley contact conductors between main line double tracks such distance may be decreased to twenty-four (24) inches." The last DTX Design Criteria (May 2009) listed this value for CHSRA as 8'-3". CAHSR FJ Blended criteria stated 9'-3". The CHSRA vehicle dynamic envelope (VDE) is the controlling clearance envelope of the DTX project. The maximum horizontal data point provided by CHSRA was 6.055 feet (assume 6'-1"). Adding 30" from CPUC results in 8'-7". Requiring 10'-0" clearance (an additional 25") of horizontal clearance on each side of all tracks would impact project cost by orders of magnitude. The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
HSR.033	CAHSR/PG/004	PGi	07/03/22	Table 7-10 - Lines 1 and 2 of this table state the same information, please advise if these should differ.	05/10/22	MJS	C	First line is below-grade, second line is at-grade	06/22/22	BCC	Agree with comment responses however listed horizontal clearance for CHSR is incorrect. States 9ft 3in this should read 10ft 8in.	10/12/22	MJS	The PMPC Team has reviewed CHSRA Design Criteria (Rev 5) Chapter 23 - Trackway Clearances. Section 23.2.1.2.1 Minimum Horizontal Clearances from High-Speed Rail Track Centerline. The 10'-8" dimension is to centerline of OCS poles (not face) so this dimension is not needed. The argument will be on the "Face of fixed equipment" being 10 feet (0 inches) clearance. Further coordination and agreement(s) between TJPA, CHSRA, and Caltrain are needed to resolve minimum horizontal clearance. Requiring 10' horizontal clearance to elements within the DTX tunnel would result in excessive and unnecessary cost given the low MAS (30mph max. within tunnel). The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
HSR.034	CAHSR/PG/005	PGi	07/03/22	Table 7-11 - clearance to tunnel crown is listed as 24ft6in desirable, 21ft6in absolute. These values do not align with the working values for CAHSR, please advise where these values were derived. CAHSR mandated values are 27ft desirable, 24ft6in absolute.	05/13/22	MM	C	Please see approved DVR 0011 allowable clearance = 21'-6".	06/22/22	BCC	Disagree with the response. CHSR DVR0011 deals with the along track positioning of OCS structures and not tunnel heights. Please can the consultant forward the supporting document they refer to. Additionally, approval of any previous DVR does not mean that those criteria can be applied wholesale across the infrastructure. The CHSR values are as stated in my original comment and must be complied with.	10/12/22	MJS	Refer to Transbay Transit Center FRA Sign-off documents prepared by PCPA and approved by TJPA and CHSRA in 2013. This document (separate from the previously referenced DVR0011) justifies the minimum vertical clearance of 21'-6". The responder (PMPC Team) recognizes the point made in the backcheck response from the commentor about the applicability of an approved design variance request (DVR 0011) - The FRA sign-off document, approved by CHSRA does set a precendence for low-speed tunnel conditions. The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
HSR.035	CAHSR/PG/006	PGi	07/03/22	This chapter refers to Chapter 17, Train Systems. I would like to review this chapter alongside its reference chapter to understand how clearances listed affect final contact wire height values.	05/10/22	MJS	C	Chapter 18, Rail Systems was not released for review when Chapter 7 was. All chapters were sent to the design team, Caltrain, and CHSRA for review comments.				05/13/22	MM	No further comments were received from this commentor subsequent to the release of Ch. 18; therefore this comments is considered closed.	05/13/22	CC
HSR.036	Table 7.12, Section 7.3.6.2, 7-13	EAS	10/01/18	LEGACY Comment HSR18.001 - Table 7.12 the minimum vertical clearance of 21' 0" does not meet the minimum allowable clearance of 23' 1" per the approved DCVR 0011	02/28/22	AG	B	DVR 0011 approved minimum allowable clearance = 21'-6". Table 7.12 has been updated to reflect approved DVR clearance.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.037	Section 7.1.2.1, 7-2	MBr	10/01/18	LEGACY Comment HSR18.034 - 7.1.2.1 Maximum Speeds through Turnouts - No. 8/9 turnout: 10 mph - trainset are restricted from operating over these turnouts due to the radius of curve within the turnout. (Trainsets cannot negotiate these turnouts) HSR trainsets cannot negotiate radii smaller than 650 feet.	02/28/22	MJS	B	According to Caltrain's third edition Design Criteria – Interim (dated August 2020) [Section 2.0.a, pp 2-24], lateral turnouts No. 8 and 9 are for yard use only.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.038	Section 7.2.2.2, 7-3	XB	10/01/18	LEGACY Comment HSR18.035 - 7.2.2.2 - minimum curve radii to be used by high-speed trains shall not be less than 650 feet.	02/28/22	AG	A	Revised per approved DVR 0001.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.039	Section 7.2.8.1, 7-6	MBr	10/01/18	LEGACY Comment HSR18.036 - 7.2.8.1 Maximum Gradient - the gradient and their associated vertical curves cannot be located where car coupling and uncoupling tasks would be normally performed. Car coupling and uncoupling must be performed on level track, zero vertical curve.	02/28/22	AG	A	Added last paragraph: "Vertical curves shall not be allowed where car coupling and uncoupling tasks would normally be performed. Car coupling and uncoupling must be performed on level track, zero vertical curve."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.040	Section 7.2.9.5, 7-7	MBr	10/01/18	LEGACY Comment HSR18.037 - 7.2.9.5 Combined Horizontal and Vertical Curvature - cannot be located where car coupling and uncoupling tasks would be normally performed. Car coupling and uncoupling must be performed on level track, zero vertical curve.	02/28/22	AG	A	Added last paragraph: "Added last paragraph: "Combined horizontal and vertical curves shall not be allowed where car coupling and uncoupling tasks would normally be performed. Car coupling and uncoupling must be performed on level track, zero vertical curve."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC

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HSR.041	Section 7.3.1.1 & Section 7.3.1.2, Figure 7.1, 7-9	XB	10/01/18	LEGACY Comment HSR18.038 - 7.3.1.1 / 7.3.1.2 - Recommend splitting these sections into Caltrain and HSR specific sections. Incorporate figure 7.1 (and associated notes) from the latest CHSR DCM, to reflect the static and dynamic outline for the HS trainset.	02/28/22	MM	C	TJPA has prepared a consolidated design criteria for this project-specific design criteria which is to provide clearances for both operators.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.042	Table 7.5, 7-9	XB	10/01/18	LEGACY Comment HSR18.039 - Table 7.5 - to be annotated to state that the dimensions provided are for the Caltrain equipment. The dimensions for the HS trainset will be provided upon selection of the trainset.	02/28/22	MM	C	TJPA has prepared a consolidated design criteria for this project-specific design criteria which is to provide clearances for both operators.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.043	Section 7.3.1.2, Figure 7.1, 7-9	MBr	10/01/18	LEGACY Comment HSR18.040 - 7.3.1.2 Vehicle Dynamic Outline - Figure 7.1, Dynamic & Static Vehicle Outline on Tangent Track will disqualify the widebody CHSR trainset to operate within the DTX facility based on Figure 7.1	02/28/22	MM	C	TJPA has prepared a consolidated design criteria for this project-specific design criteria which is to provide clearances for both operators.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.044	Section 7.3.1.3, 7-11	XB	10/01/18	LEGACY Comment HSR18.041 - 7.3.1.3 - Vehicle inswing/outswing dimensions for the widebody HS trainset to be provided upon selection of the trainset.	02/28/22	MM	B	Inswing/outswing equations provided in CHSRA TM 1.1.10 used. The design criteria is a living document that will be updated once CHSRA has selected a vehicle.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.045	Section 7.3.2, 7-11	MBr	10/01/18	LEGACY Comment HSR18.042 - 7.3.2 Horizontal Running Clearances - based on 7.3.1.2 and Table 7.8 neither Caltrain EMU nor widebody CHSR Trainset can comply	02/28/22	AG	A	Clearance revised to 42" based on 10' TCL clearance and 6.5' dynamic vehicle outline per Appendix Figure 3.E.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
HSR.046	Section 7.3.5.2, 7-12	MBr	10/01/18	LEGACY Comment HSR18.043 - 7.3.5.2 Structure Tolerances are based on Table 7.8 and should only be specified after the value on Table 7.8 have been finalized.	02/28/22	MJS	B	Unless otherwise directed, the values provided in Table 7-8 will stand as the structure tolerances.				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with applicable criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.047	Table 7.11, 7-13	XB	10/01/18	LEGACY Comment HSR18.044 - Table 7.11 - recommend the following revisions: Clearance to high-level walkway for CHSRA = 6 ft Track centerline to edge of level platform for CHSRA = 6 ft	02/28/22	AG	A	Per blended design criteria checklist: TCL to platform (Caltrain) = 5'-7" TCL to CHSRA platform = 6'-0"				05/13/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/13/22	CC
HSR.048	Chapter 7 (General)	JD	10/01/18	LEGACY Comment HSR18.075 - Update CHSRA engineering criteria reference to current edition	02/28/22	AG	A	Updated references.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. CHSRA did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
TA.001	Chapter 7, Guideway Geometrics (General, header)	LZ	07/04/22	Delete "Transit Center" for consistency with the other chapters	09/01/22	KS	C	Unclear where there is inconsistency; however, updated one occurrence of "transit center" to "Salesforce Transit Center." Salesforce Transit Center is referenced in other sections where stations are discussed.				09/18/22	MJS	The responder (PMPC Team) will conduct an internal Quality Assurance/Quality Control (QA/QC) review to ensure there is consistent language throughout the document.	09/18/22	CC
TA.002	Chapter 7, Guideway Geometrics (Codes, Standards, and Guidelines)	LZ	07/04/22	In codes and standards there is no mention of Caltrain. It seems there should be, considering the section is about Guideway Geometrics	09/01/22	MJS	B	The first paragraph states the following: "These criteria are primarily governed by the Caltrain Design Criteria and incorporate approved design variances from Caltrain."				09/18/22	MJS	The responder (PMPC Team) clarified that the DTX guideway geometrics (Chapter 7) and trackwork (Chapter 8) are governed by Caltrain Design Criteria.	09/27/22	CC

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 08, Trackwork*		
Document date:	*2/28/2022*		

Reviewers

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Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
L. Godbold (Design Team)	LDG	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Pedro Gutierrez (Caltrain)	PCG
Rick Bartholomew (Caltrain)	RB	Bin Zhang (Caltrain)	BZ
Douglas McLoud	DMcL	M. Brunner (CHSRA)	MBr
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GEC.001	Chapter 08 - Trackwork	SM	03/17/22	See tracked changes and review comments in "Chapter 08 Trackwork comments.pdf"	04/25/22	MJS	C	Incorporated into this CRL - See Comments #GEC.002-GEC.023	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.002	8.1.3 - Direct Fixation, ¶1-1	CU	03/17/22	This language implies a popular proprietary booted rail track system by Sonneville called "Low Vibration Track (LVT)." Broaden the language to allow the contractor to propose other track system types as the supplier technologies evolve. I suggest not making rail boots mandatory. Noise and vibration mitigation can be mitigated by high-resilience DF fasteners. Also, recent research indicate booted rail systems tend to experience corrugation issues. Therefore there should be performance language here or in specs to ensure suppliers demonstrate their products address such issues.	05/11/22	MJS	A	Agree, language will be added.	08/05/22	ROK	See related NEW Comments	9/30/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	9/30/2022	CC
GEC.003	8.1.3 - Direct Fixation, ¶1-1	CU	03/17/22	To give future contractors flexibility, please also include non-plinth option of pre-cast DF block track embedded in reinforced in-fill concrete. This construction method allows for faster installation in underground environments compared with cast-in-place DF trackwork.	05/11/22	MJS	A	Agree, language will be added.	08/05/22	BCC	The Draft DTX Design Criteria does not include this added language	9/27/2022	MJS	See responses to GEC.040 (Issue was addressed during CRM held with Caltrain and GEC on 9/27/2022)	9/27/2022	CC
GEC.004	8.1.3 - Direct Fixation, ¶1-1	CU	03/17/22	May be cast-in-place or pre-cast	05/11/22	MJS	A	Agree, language will be added.	08/05/22	BCC	The Draft DTX Design Criteria does not include this added language	9/27/2022	MJS	See responses to GEC.040 (Issue was addressed during CRM held with Caltrain and GEC on 9/27/2022)	9/27/2022	CC
GEC.005	8.1.4 - Embedded Track, ¶2-1	SM	03/17/22	What is to be used if designer can't demonstrate this?	05/11/22	MJS	A	Revised to read as follows: "The design of at-grade crossing track must conform with Caltrain Design Criteria. Refer to section 8.2.7 and section 8.7."	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.006	8.2.2 - Concrete Ties, ¶3-1	SM	03/17/22	This contradicts section 8.1.4 above.	05/19/22	MM	A	Embedded track section has been removed from criteria.	08/05/22	BCC	Embedded track construction is required at the flood control gates at the end of the U-wall.	9/27/2022	MJS	See responses to GEC.040 (Issue was addressed during CRM held with Caltrain and GEC on 9/27/2022)	9/27/2022	CC
GEC.007	8.2.2 - Concrete Ties, ¶5-1	SM/FB	03/17/22	In regards to "Concrete tie design must not be factored." - (SM) Not clear what this means. (FB) This is referencing AREMA Chap 30, Part 4 - but definitely needs clarification	05/13/22	MJS	A	Revised to read as follows: "Concrete tie design must not be factored and conform to AREMA Manual for Railway Engineering, Chapter 30, Part 4."	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	8.2.3 - Timber Ties, ¶1-2	FB	03/17/22	In regards to : "..9 feet in length" - Standard is 8'-6"	05/13/22	MJS	A	Revised as noted.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	8.2.3 - Timber Ties, ¶2-1	FB	03/17/22	Need to address fastening system: Spikes and anchors, or spring clips	05/13/22	MJS	A	Updated per Caltrain comment #Cal.008-009	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	8.2.3 - Timber Ties, ¶3-2	FB	03/17/22	What is length of transition section, and what is tie spacing?	05/13/22	MM	A	Text has been updated to reference Caltrain Standard Drawings for the transition section.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	8.2.6 - Geotextile Fabric, ¶1-3	FB	03/17/22	Define type of geotextile and its purpose. If for strength then maybe it should be geogrid.	05/13/22	MJS	B	Means and methods - should be left to the discretion of Design Builder.	08/05/22	BCC	Design team does not agree - This is not resolved	9/27/2022	MJS	Issue was addressed during CRM held with Caltrain and GEC on 9/27/2022	9/27/2022	CC
GEC.012	8.2.7 - Hot-Mix Asphalt Concrete (HMAC) Underlayment, ¶1-1	SM/FB	03/17/22	(SM) Where is this required (HMAC)? (FB) Areas of very soft subgrade? Is this the only acceptable solution for weak soils?	05/19/22	MM	C	For at-grade crossings. Text has been updated to reference Caltrain Design Criteria Chapter 2 - Track Park B - Track Structure.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.013	8.2.8.2 - Noise and Vibration Mitigation, ¶1-2	FB	03/17/22	Where is this requirement (required mitigation) defined?	05/19/22	MM	C	The 2018 SEIS/EIR. Text has been updated to reference this document.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.014	8.3 - Special Trackwork (Turnouts and Crossovers), ¶5-3	FB	03/17/22	What about the curved crossovers, non-standard numbers, MFPs?	05/19/22	MM	A	Non-standard trackwork requires a Design Variance Request to be submitted and approved by Caltrain. Text has been added to this end.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.015	8.5.1 - Rail Lubrication, ¶1-1	SM	03/17/22	Revise to read as follows: "..installed on all tracks to lubricate the following locations.." NOTE: One lubricator location can cover multiple curves on a track. A lubricator does not need to be installed at every curve.	05/09/22	MJS	A	Revised as noted.	08/05/22	BCC	Lubricators are typically only installed at one end of a curve at the incoming end based on the predominant direction of travel, not both ends as stated.	9/1/2022	MJS	Section revised to address this reopened comment.	9/27/2022	CC
GEC.016	8.5.1 - Rail Lubrication, ¶1-1	FB	03/17/22	Revise to read as follows: "..(Volume 1 Track, Chapter 5, part 5, and section 5.8.."	05/09/22	MJS	A	Revised as noted.	08/05/22	BCC	Reference to AREMA seems to have been erased.	9/1/2022	MJS	Section revised to address this reopened comment.	9/27/2022	CC
GEC.017	8.5.2 - Bumping Posts, ¶1-2	CU	03/17/22	"three ties" applies for ballasted track	05/19/22	MM	A	Agree. Removed reference to three ties.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.018	8.5.2 - Bumping Posts, ¶1-4	CU/SM	03/17/22	(CU) Suggest replacing "stopping envelope" with "stopping distance" (SM) 20' seems short. Should provide a performance requirement. Assumed speed and required stopping distance.	05/19/22	MM	A	Agree. Replaced text as follows: "Bumping posts must be designed to protect passengers and crew on the train, adjacent trains, and the platforms in the event of an over-run. The design must consider the track configuration, maximum likely speed, and rolling stock characteristics."	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.019	8.5.2 - Bumping Posts, ¶1-4	FB	03/17/22	Hydraulic or sliding? What is the relation of the insulated joint to the face of the bumping post?	05/13/22	MJS	A	Revised per comment #Cal.021	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.020	8.6.1 - Guard Rails	FB	03/17/22	Type? RE or U69?	05/25/22	MJS	DE	Type will be defined at next revision of the DTX Design Criteria	08/05/22	BCC	This is a deferred comment, not a closed one.	9/27/2022	MJS	Issue was addressed during CRM held with Caltrain and GEC on 9/27/2022	9/27/2022	CC
GEC.021	8.6.2 - Derailment Containment Devices	FB	03/17/22	This is not a Derail. Change title to "Derails"	05/09/22	MJS	A	Revised as noted.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.022	8.6.2 - Derailment Containment Devices, ¶1-1	FB	03/17/22	Cannot verify nor evaluate (reference to Caltrain Design Criteria)	05/09/22	MJS	C	The reference to Caltrain Design Criteria is accurate.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.023	8.7 - At-Grade Crossings	CU	03/17/22	Encroachment of special trackwork into at-grade crossings should be avoided. Where unavoidable, low-profile embedded track turnouts may be used.	05/19/22	MM	A	Embedded track section has been removed from criteria.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.024	Section 8.1.2 Page 8-1 of 5	LDG	09/12/16	LEGACY Comment GEC16.030 - 8.1.2 Add "(including elastic fastening system)" after the word "ties".	02/28/22	AG	A	Added.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.025	Section 8.1.3 Page 8-1 of 5	LDG	09/12/16	LEGACY Comment GEC16.031 - 8.1.3 Add "(reinforced plinth pads)" after word "seats".	02/28/22	AG	A	Added.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 109
Comments Closed 109
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 08, Trackwork*		
Document date:	*2/28/2022*		

Reviewers

Name	Initials	Name	Initials
Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
L. Godbold (Design Team)	LDG	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Pedro Gutierrez (Caltrain)	PCG
Rick Bartholomew (Caltrain)	RB	Bin Zhang (Caltrain)	BZ
Douglas McLoud	DMcL	M. Brunner (CHSRA)	MBr
Luis Zurinaga (SF CTA)	LZ		
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

AC – Action Code
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C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.026	Section 8.1.3 Page 8-1 of 5	LDG	09/12/16	LEGACY Comment GEC16.032 - 8.1.3 Add "special trackwork (turnouts and crossovers)" after the word "fastenings".	02/28/22	AG	A	Added.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.027	Section 8.2.1 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.033 - 8.2.1 Change AREMA reference to most current: AREMA Manual for Railway Engineering, Volume 1A Track, CHAPTER 4 RAIL, Part 1 Design of Rail and Part 2 Manufacture of Rail.	02/28/22	AG	B	Revised text to read: "...AREMA Manual for Railway Engineering." It is preferred to not over specify reference section to avoid missing information.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with relevant criteria; therefore this comment is considered closed.	8/5/2022	CC
GEC.028	Section 8.2.1 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.034 - 8.2.1 Section 2 – recommend that high strength rail …."shall be used in all special trackwork, in curves with a radius which is less than or equal to 1910.08 feet (3° curve) and in all spirals of curves which have a central curve with a radius which is less than or equal to 1910.08 feet (3° curve)."	02/28/22	MJS	B	See response to Caltrain comments Cal18.024 and Cal18.025. Revised text to read as follows: "..with a Brinell Harness Number of 370 will be used in all special trackwork and new tracks."	08/05/22	ROK		8/5/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.029	Section 8.2.1 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.035 - 8.2.1 Section 4 – Recommend adding minimum length for CWR strings and allowing thermite welds for special trackwork and for connecting CWR strings.	02/28/22	MJS	C	There is no minimum CWR string length in the Caltrain Design Criteria (third edition, dated August 31, 2020)	08/05/22	ROK		8/5/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.030	Section 8.2.2 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.036 - 8.2.2 Section 1 – Add "running" after words: mainline, yard and revenue.	02/28/22	AG	A	Added.	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.031	Section 8.2.2 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.037 - 8.2.2 Section 2 – After the word "Engineering" add: "Volume 1b Track, Chapter 30 Ties, Part 4 Concrete Ties."	02/28/22	AG	B	Revised text to read: "...AREMA Manual for Railway Engineering." It is preferred to not over specify reference section to avoid missing information.	08/05/22	ROK		8/5/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.032	Section 8.2.2 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.038 - 8.2.2 Add new section: "Concrete ties with fastening system shall be tested as a unit and shall meet all test recommendations of AREMA Section 4.9 Testing of Monoblock Ties."	02/28/22	AG	A	Added paragraph: "Concrete ties with fastening system will be tested as a unit and must meet all test recommendations of AREMA Manual of Railway Engineering."	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.033	Section 8.2.2 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.039 - 8.2.2 Add new section: Concrete tie design shall not be factored.	02/28/22	AG	A	Added, "Concrete tie design will not be factored."	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.034	Section 8.2.3 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.040 - 8.2.3 Section 2: After the word "trackwork" add: "except for special trackwork on direct fixation".	02/28/22	AG	A	Added.	08/05/22	ROK	See related NEW Comments	9/30/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	9/30/2022	CC
GEC.035	Section 8.2.3 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.041 - 8.2.3 Section 3: After the word "Engineering" add: "Volume 1b Track, Chapter 30 Ties, Part 3 Solid Sawn Timber Ties."	02/28/22	AG	B	It is preferred to not over specify reference location to avoid missing information.	08/05/22	ROK		9/30/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.036	Section 8.2.3 Page 8-2 of 5	LDG	09/12/16	LEGACY Comment GEC16.042 - 8.2.3 Section 4: Recommend changing transition tie layout from 10 foot long ties to: "fifteen ties 11 feet long followed by sixteen ties 10 feet long all on 19.5 inch centers. The 15 foot long ties shall be adjacent to the track with the highest modulus"	02/28/22	MJS	B	Caltrain Design Criteria (third edition, dated August 31, 2020) governs trackwork criteria per Operators agreement memorandum. The criteria will match Caltrain's transition tie layout schema.	08/05/22	ROK		9/30/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.037	Section 8.2.4 Page 8-3 of 5	LDG	09/12/16	LEGACY Comment GEC16.043 - 8.2.4 Add section: "Ballast under concrete ties shall meet the recommendations of AREMA Manual of Railway Engineering Volume 1A Track, Chapter 1 ROADWAY AND BALLAST, Part 2 Ballast and shall be limited to crushed granites, traprocks or quartzites. Ballast shall be graded to AREMA No. 4 (1-1/2" to ¾")."	02/28/22	MJS	B	Caltrain Design Criteria governs trackwork per Operators agreement memo. Revised section to read as follows: "Reference Caltrain Design Criteria Chapter 2 – Track, Section 5.0 – Ballast."	08/05/22	ROK		9/30/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	8/5/2022	CC
GEC.038	Section 8.2.6 Page 8-3 of 5	LDG	09/12/16	LEGACY Comment GEC16.044 - 8.2.6 Recommend discussion with geotech about location of geotextile fabric. Design Criteria says between ballast and subballast. Many projects call for filter fabric between subballast and roadbed. Geogrids and fabrics should be discussed.	02/28/22	MJS	B	Caltrain Design Criteria (Third Edition, dated August 31,2020) states the following: "To increase the performance life and reliability of the track structure, biaxial geogrid shall be included in the subballast design, unless the subgrade and an R-value greater than 40 or will be stabilized with lime or cement. Where the subgrade is soft or has relatively poor drainage, the subballast shall be increased to 12 inches over geofabric; or, if necessary, shall consist of at least 8-inch-thick HMAC over geofabric."	08/05/22	ROK	See related NEW Comments	9/30/2022	MJS	Original commentor replied to PMPC Team's response with "ROK", therefore this comment is considered closed.	9/30/2022	CC
GEC.039	Section 8.4 Page 8-4 of 5	LDG	09/12/16	LEGACY Comment GEC16.045 - 8.4 Recommend removing word "specifications" and replace with: "Manual of Railway Engineering Volume 1A Track, Chapter 4 Rail, Section 3.8 SPECIFICATIONS FOR BONDED INSULATED RAIL JOINTS."	02/28/22	AG	A	Replaced "specifications" with "Manual of Railway Engineering".	08/05/22	ROK		8/5/2022	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	8/5/2022	CC
GEC.040	8.1.3 Direct Fixation Track	CU	07/01/22	(First sentecne "..(reinforced plinth pads).." - replace with: " embedded in reinforced plinths or reinforced infill slabs"	09/01/22	MJS	A	Revised as noted.				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC
GEC.041	8.2.1 Running Rail	CU	07/05/22	(First sentence, third paragraph) Replace "1660 feet" with "1440 feet" per Caltrain Standard	09/01/22	MJS	A	Revised as noted.				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC
GEC.042	8.2.3 Timber Ties	CU	07/05/22	Revise first sentence to read as follows: "..temporary trackwork, including special tracwork on ballasted track as part of staged construction.;	09/01/22	MJS	A	Revised as noted.				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC
GEC.043	8.2.3 Timber Ties	CU	07/05/22	(third paragraph) This should go under a new section titled "Transitions" Tracks shall be designed to provide smooth transition between different types and changing track modulus. Reinforced concrete bridging slabs shall be provided at transitions betwen direct fixation and ballast. In ballasted track areas with concrete or timber ties, longer ties shall be used per Caltrain Standard Drawings to transition between standard tie zones and high modulus special trackwork or at-grade crossing zones. Direct fixation block spacing shall be adjusted between areas of standard fasteners and high-resilience fasteners.	09/01/22	MJS	A	Revised as noted.	10/07/22	CU	CRM held on 10/7 with Design Team (Chukwuma U.) where language was agreed and comment closed.	10/7/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/7/2022	CC
GEC.044	8.2.6 Geotextile Fabric	CU	07/05/22	(First paragraph) OK to replace with or reference language from Caltrain Design Criteria per comment GEC.038 response.	09/01/22	MJS	A	Revised as noted.				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 109
Comments Closed 109
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 08, Trackwork*		
Document date:	*2/28/2022*		

Reviewers			
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Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
L. Godbold (Design Team)	LDG	Stephen Metz (Design Team)	SM
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Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.045	8.5.1 Rail Lubriation	CU	07/05/22	Revise first sentence to read as follows: "….and be installed to lubricate both ends of each curve on all tracks at the following locations.."	09/01/22	MJS	B	Revised section as follows: "Train-activated rail lubricators must conform with AREMA (Volume 1 – Track, Chapter 5, Part 5, section 5.9 Wayside Lubrication of Rail on Curves and the manufacturer's recommendations. The design and location of lubricators must and include an analysis to ensure the following locations are provided with sufficient lubrication to be installed at both ends of each curve on all tracks to lubricate the following locations to prevent excessive rail wear and provide noise abatement: •Curved approach to the DTX between Seventh and Townsend streets •Curved transition between Townsend and Second streets •Throat structure approach to the Transit Center directionRail lubricators located below grade must be designed to support remote monitoring, electronic type functioning system, and provide containment of the lubricant in case of malfunction or rupture of a hydraulic hose or valve.				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC
Cal.001	Chapter 8 Section 8.1.2	PCG	03/21/22	Referencing to section 8.7, change to section 8.1.4 Embedded track, as we are specifying embedded track to be used for at grade crossings	05/11/22	MJS	A	Removed reference to section 8.7 - At-Grade Crossings.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.002	Chapter 8 Section 8.1.3	PCG	03/21/22	change to read: "…….(turnouts and crossovers) guard rail and ……."	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.003	Chapter 8 Section 8.1.4	PCG	03/21/22	Embedded track is not in Caltrain standards, specify and reference a proven design to be used in addition to meeting other Caltrain design criteria	05/11/22	MJS	A	Revised section to "At-grade crossing track" to read as follows: "The design of at-grade crossing track must conform with Caltrain Design Criteria. Refer to section 8.2.7 and section 8.7."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.004	Chapter 8 Section 8.1.4	PCG	03/21/22	change to read: "…….guard rail and running rail……."	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.005	Chapter 8 Section 8.2.1	PCG	03/21/22	add Caltrain Standards, and specifications	05/09/22	MJS	A	Revised to read as follows: "Running rail for permanent tracks and special trackwork must be new. Running rail will be 136 RE rail section and must conform to Caltrain Standards. "	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.006	Chapter 8 Section 8.2.1	PCG	03/21/22	3rd paragraph - Change 132 to 136 # second hand rail, rail must meet main line specification and be pretested for internal defects	05/09/22	MJS	A	Third paragraph deleted. First paragraph modified as follows: "Running rail for permanent tracks and special trackwork must be new. Temporary tracks to support staged construction that will not be in service more than two years may be previously used but must be pretested for internal defects. Running rail will be 136 RE rail section and must conform to Caltrain Standards."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.007	Chapter 8 Section 8.2.1	PCG	03/21/22	4th paragraph - Change to, Rail must be manufactured and plant welded into minimum of 1660' rail lengths, 80' rail sections may be allowed to be flush butt welded within the project limits	05/09/22	MJS	A	Revised to read as follows: "Rail must be manufactured and plant welded into continuously welded rail with a minimum section length of 1660 feet. Within project limits, 80-foot-long rail sections may be welded by electric flash butt method."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.008	Chapter 8 Section 8.2.2	PCG	03/21/22	add Caltrain Standards, and specifications for main line track ties	05/09/22	MJS	A	Revised to read as follows: "Concrete ties must be used for all permanent at-grade mainline running tracks, yard running tracks, and non-revenue running tracks. Concrete ties must conform to Caltrain Standards." Note that Caltrain Standards include design criteria, standard drawings, and specifications. Also note that Caltrain design criteria already references AREMA manual for railway engineering.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.009	Chapter 8 Section 8.2.2	PCG	03/21/22	4th paragraph - Add: Fastening system must be galvanized or applied with a moisture/rust resistant paint coat	05/09/22	MJS	A	Added the following sentence: "Concrete tie fastening system must be galvanized or applied with a moisture and rust resistant paint."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.010	Chapter 8 Section 8.2.3	PCG	03/21/22	Left blank	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.011	Chapter 8 Section 8.2.4	PCG	03/21/22	Change to read: "Timber wood ties with 16" pandrol plates, e-clip and screw spikes may be used……."	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.012	Chapter 8 Section 8.2.4	PCG	03/21/22	add: ""…….standard timber tie sections, wood tie or concrete tie to direct fixation track standard concrete tie section and ……."	05/09/22	MJS	A	Text has been revised to point to Caltrain Design Criteria Chapter 2 Track, Section B - Track Structure - Subsection 5.0 Ballast.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.013	Chapter 8 Section 8.2.4	PCG	03/21/22	Change to read: "At approaches to bridges and at-grade crossings ……."	05/09/22	MJS	C	There are no bridges (that are not direct-fixation) within the DTX project limits.				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.014	Chapter 8 Section 8.2.9.1	PCG	03/21/22	change to read " ……be designed to resist corrosion in wet / dry environment, to maximize……." or specify heavy duty corrosion and wet / dry electrical resistant plates and fasteners, with double plate bonded elastomer be utilized such as XXX or equivalent	05/12/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.015	Chapter 8 Section 8.2.9.2	PCG	03/21/22	What is the required mitigation for noise and vibration?	05/13/22	MM	A	The required mitigations for noise and vibration are defined in the TJPA's 2018 Supplemental EIS/EIR. A reference to this document has been added to the design criteria.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.016	Chapter 8 Section 8.3	PCG	03/21/22	Remove No. 11 and No. 15 turnouts, they are not Caltrain standard turnouts	05/13/22	MM	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.017	Chapter 8 Section 8.3	PCG	03/21/22	Remove 'miter cut"	05/12/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.018	Chapter 8 Section 8.4	PCG	03/21/22	add: be factory assembled, meeting Caltrain Standards	05/12/22	MJS	A	Revised to read as follows: "Insulated joints must be prefabricated, factory assembled, epoxy-bonded, 36-inch, six-hole bar design assemblies conforming to AREMA Manual for Railway Engineering and Caltrain Standards."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.019	Chapter 8 Section 8.5.1	PCG	03/21/22	Recommend adding remote monitoring for rail lubrication within the below grade lubricators, lubrication system shall be design for remote monitoring, electronic type functioning system, and provide containment of the lubricant in case of malfunction or rupture of a hydraulic hose."	05/22/22	MM	A	Revised as noted	05/25/22	ROK		05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.020	Chapter 8 Section 8.5.1	PCG	03/21/22	How were this location determined? Recommend a study be performed by a qualified firm to determine rail lubrication requirements	05/19/22	MM	C	This is a comprehensive list of all curves in the project.				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

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Comments Closed 109
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 08, Trackwork*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
L. Godbold (Design Team)	LDG	Stephen Metz (Design Team)	SM
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Rick Bartholomew (Caltrain)	RB	Bin Zhang (Caltrain)	BZ
Douglas McLoud	DMcL	M. Brunner (CHSRA)	MBr
Luis Zurinaga (SF CTA)	LZ		
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
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Cal.021	Chapter 8 Section 8.5.2	PCG	03/21/22	add: bumping post shall be hydraulic bumping post meeting / conforming to Caltrain new rail fleet. Some may be equipped with a red light?	05/12/22	MJS	A	Revised to read as follows: "Hydraulic bumping posts must be installed, at minimum, three ties before the end of the track or to conform with manufacturer's recommendations and be compatible with Caltrain's new rail fleet."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.022	Chapter 8 Section 8.6	PCG	03/21/22	Change to read: " Derailment Containment and Derails"	05/12/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.023	Chapter 8 Section 8.6.1	PCG	03/21/22	Restraining rails also called Guard Rails, they are also used on curved track, 8.6.1 requires that restraining rails be installed in tunnels which covers the entire below grade track	05/19/22	MM	A	Add text to acknowledge guard rails use on curved track.	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
Cal.024	Chapter 8 Section 8.6.2	PCG	03/21/22	Change 'Derailment Containment Devices to " Derailing Devices" or 'Derails" derails are not derailment containment devices,	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.025	Chapter 8 Section 8.6.2	PCG	03/21/22	first paragraph change to read: " The design and application of derails must conform to ……."	05/09/22	MJS	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.026	Chapter 8 Section 8.7	PCG	03/21/22	Add: "……..ad grade crossings shall be constructed as embedded track, the system must be of a proven design, meeting Caltrain Design Criteria and Standards and be submitted for approval" see Section 8.1.4 Embedded Track	05/09/22	MJS	B	Previous comment #Cal.003 stated that "embedded track" is not in Caltrain Design Criteria.				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.027	Section 8.1.3	AB	10/18/18	LEGACY Comment Cal18.023 - Any requirement for the transition zone from a ballasted track to a direct fixation track?	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-7]: "Transition ties shall be used in areas where track modulus changes significantly. These areas include approaches to bridges and at-grade crossings. Ten-foot-long transition timber ties shall be used for standard timber tie track segments, and 10-foot-long transition concrete ties shall be used for standard concrete tie track segments. Refer to Caltrain Standard Drawings for further details." See section 8.2.3	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.028	Section 8.2.1	HL	10/18/18	LEGACY Comment Cal18.024 - Section 8.2.1 Running Rail (second paragraph, striked text) - "..Brinell Hardness Number between 360 and 388.." Replace stricken text with "..minimum Brinell Hardness of 370.."	02/28/22	MJS	A	Revised to read as follows: "..with a Brinell Harness Number of 370 will be used in all special trackwork and new tracks."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.029	Section 8.2.1	HL	10/18/18	LEGACY Comment Cal18.025 - Section 8.2.1 Running Rail (second paragraph, striked text) - "..curves with radii that measure less than 1,150 feet." Replace stricken text with "..tracks."	02/28/22	MJS	A	Revised to read as follows: "..with a Brinell Harness Number of 370 will be used in all special trackwork and new tracks."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.030	Section 8.2.2	HL	10/18/18	LEGACY Comment Cal18.026 - 10 ft concrete ties shall be used for at-grade crossings	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-7]: Revised section to read as follows: "For at-grade crossings, concrete ties 10 feet in length, suitable for moisture-prone environment will be installed to accommodate crossing panels and enhanced load distribution for additional vehicular traffic."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.031	Section 8.2.3	HL	10/18/18	LEGACY Comment Cal18.027 - Section 8.2.3 Timber ties (second paragraph, striked text) - "Timber.." Replace stricken text with "Concrete.."	02/28/22	MJS	A	Removed second paragraph.	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.032	Section 8.2.3	HL	10/18/18	LEGACY Comment Cal18.028 - Section 8.2.3 Timber ties (after fourth paragraph, add following text) At approaches to at-grade crossings, if the at-grade crossing ties and the adjacent standard ties are both concrete, the transition ties shall also be concrete.	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-6]: "Only concrete ties shall be used for new construction of main tracks.." and [pp 2-7] "Standard ties for at-grade crossings are concrete suitable for moisture-prone environment. They are 10 feet long to accommodate concrete crossing panels, and to provide enhanced load distribution for additional vehicular traffic."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.033	Section 8.2.5	HL	10/18/18	LEGACY Comment Cal18.029 - Section 8.2.5 Subballast (last sentence): Please justify 3% cross slope	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 2-4]: "The top subgrade must be graded so that there is a minimum 2 percent cross slope toward the adjacent ditch or embankment slope, or to another longitudinal drainage system." Note, this section was revised/removed to read as follows: "Reference Caltrain Design Criteria Chapter 2 - Track, Section B - Track Structure, subsection 3.0 - Subballast."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.034	Section 8.3	HL	10/18/18	LEGACY Comment Cal18.030 - Section 8.3 Special Trackwork (Turnouts and Crossovers): second paragraph, second bullet No. 9 and No. 15 are not standard sizes in Caltrain Engineering standard	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Section 2.0, pp 2-24]: "a. Lateral turnouts numbers 8 and 9 for yards b. Lateral turnouts numbers 10, 14, 20, for main line; number 20 shall be used where there are no real estate constraints c. Number 9 double-slip switches may be used in terminals d. Turnouts with Hollow Steel Ties in accordance with Standard Drawings SD-2000 series shall be used for new constructions"	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 08, Trackwork*		
Document date:	*2/28/2022*		

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Cal.035	Section 8.5.1	HL	10/18/18	LEGACY Comment Cal18.031 - Section 8.5.1 Rail Lubrication (revise first sentence to read as follows) "Train-activated rail lubricators shall be installed on all tracks to prevent excessive..."	02/28/22	MJS	A	Added	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.036	Section 8.6.2	HL	10/18/18	LEGACY Comment Cal18.032 - Section 8.6.2 Derailment Containment Devices (first sentence - "..such as low radius curves and special trackwork." Please provide more detail about when it will be installed? i.e. If it is radius related, under what radius will it be used? and what are the limits to use derailment containment. e.g. x feet ahead of and pass the TO, etc.	02/28/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Chapter 2.D, Section 3.0 DERAILS, pp 2-25]: "Derails shall be installed on the downgrade end of yard and secondary track that is normally used for storage of unattended vehicles, if this track is directly connected to the main track, and if its prevailing grade is descending toward the main track. With approval from the Caltrain Deputy Director of Engineering, derails may be used at other track locations where cars are moved or locomotives are stored, to prevent or minimize injury to passengers and personnel, and/or damage to equipment. Derails shall be located so that they derail equipment in a direction away from the main track. Derails shall be located beyond the clearance points of converging tracks. Double-point split-switch derails are installed at locations as required by Caltrain's Operations and Engineering departments, including locations where operating locomotives are stored and where cars are moved or switched by nonrailroad personnel." Updated/revised section to read as follows: "Reference Caltrain Design Criteria, Chapter 2 -Track, Section D - Special Trackwork, Section 3.0 - Derails.	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.037	Section 8.7	RB	10/18/18	LEGACY Comment Cal18.033 - Section 8.7 At-Grade Crossings (highlighted text "..in accordance with CPUC.." and FRA	02/28/22	MJS	A	Revised text to read as follows as Caltrain Design Criteria already requires conformance with ADA, FRA, and CPUC requirements: "Reconfiguration of surface trackwork and systems at existing or proposed at-grade crossings must conform with Caltrain Design Criteria."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/09/22	CC
Cal.038	Chapter 8 Section 8.1.2; (Page 8-2 of 6)	PCG	06/15/22	second sentence: remove exception for at grade crossings. All at grade track shall be constructed with ballasted track including grade crossings.	09/02/22	MJS	A	Revised second paragraph as follows: "Ballasted track must be used for all at-grade mainline and non-revenue tracks including at-grade crossings."				10/3/2022	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/2/2022	CC
Cal.039	Chapter 8 Section 8.5.1; (Page 8-5 of 6)	BZ	06/30/22	Last paragraph: A study performed by a qualified firm to determine rail lubrication requirements is needed in the next phase design.	09/02/22	MJS	A	Revised section as follows: "Train-activated rail lubricators must conform with AREMA (Volume 1 – Track, Chapter 5, Part 5, section 5.9 Wayside Lubrication of Rail on Curves and the manufacturer's recommendations. The design and location of lubricators must and include an analysis to ensure the following locations are provided with sufficient lubrication to be installed at both ends of each curve on all tracks to lubricate the following locations to prevent excessive rail wear and provide noise abatement: •Curved approach to the DTX between Seventh and Townsend streets •Curved transition between Townsend and Second streets •Throat structure approach to the Transit Center directionRail lubricators located below grade must be designed to support remote monitoring, electronic type functioning system, and provide containment of the lubricant in case of malfunction or rupture of a hydraulic hose or valve.				9/27/2022	MJS	The PMPC Team met with Caltrain and the Design Team for a CRM held on 9/27/2022 where this isue was resolved.	9/27/2022	CC
HSR.001	All references	DMcL	03/22/22	Is the use of the word 'must' correct in this document	05/09/22	MJS	C	Verbiage has been selected and approved by the TJPA to be used in this DTX Design Criteria Revision Book 02				05/13/22	MM	The responder (PMPC Team) has determined that the language is consistent with project standards.	05/13/22	CC
HSR.002	8.1.1	DMcL	03/22/22	The track gauge will be 4 feet 8.5 inches, not just on tangent track except on tight radius curves where gauge widening may be required.	05/12/22	MJS	A	Revised to read as follows: "Track gauge will be 4 feet 8.5 inches, measured at 0.625 inches below the head of the rail on the gauge side on all tracks except on tight radius curves where gauge widening may be required."	06/27/22	ROK	Accepted with amendments. At what radius will gauge widening be required. Does the project have radii that fit the criteria, if so gage widening criteria needs to be shown	10/7/2022	MJS	The responder (PMPC Team) agrees to coordinate with operators and define threshhold for gauge widening and requirements will be addessed at the next stage of design. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/7/2022	CC
HSR.003	8.1.2	DMcL	03/22/22	My understanding is that ballasted track is in the design criteria due to the length of the project being extended	05/12/22	MJS	C	Ballasted track will be used for the at-grade portion of the alignment (Main line, Maintenance of Way, and Turnback Track) except for at-grade crossings at 16th Street and Mission Bay Drive.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.004	8.1.3	DMcL	03/22/22	In accordance with the Caltrain Design Criteria direct fixation track will not be used, (see Chapter 2, Track Section A- General)	05/13/22	MM	DE	Caltrain's Design Criteria are for at-grade trackwork. TJPA will seek a variance from Caltrain for this criteria due to the tunnel condition.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.005	8.1.4	DMcL	03/22/22	Where is the embedded track located on the project.	05/12/22	MJS	A	See response to comment #Cal.003. Will be updated.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.006	8.2.1	DMcL	03/22/22	A Brinell Hardness would normally be shown as BHN	05/12/22	MJS	C	Noted, however since this is only referred to once, there is no need to add the acronym.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.007	8.2.1	DMcL	03/22/22	3rd paragraph. Is there a likelihood that this may happen as it is temporary track and where is it located (also see 9 below), also what type of ties will any temporary track have. Also Caltrain Design Criteria states that all new track will be 136 RE rail on concrete ties.	05/12/22	MJS	A	Revised to read as follows: "Running rail for permanent tracks and special trackwork must be new. Temporary tracks to support staged construction that will not be in service more than two years may be previously used but must be pretested for internal defects. Running rail will be 136 RE rail section and must conform to Caltrain Standards."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.008	8.2.2	DMcL	03/22/22	How has the concrete tie spacing been calculated	05/12/22	MJS	C	Concrete tie spacing is 24 inches based on Caltrain Design Criteria Chapter 2 - Track, Part B - Track Structure, Section 6.0 - Ties.	06/27/22	ROK	Accepted but the PMPC response needs amending as the section for Ties is in : B Track Structure, Section 6 not 7.	10/3/2022	MJS	Revised as noted.	10/3/2022	CC
HSR.009	8.2.3	DMcL	03/22/22	Any temporary track should be mentioned as to possible location as previously the document states that all ties shall be concrete.	05/12/22	MJS	A	Revised second paragraph as follows: "Timber ties may only be used for temporary conditions and must conform to the requirements of the AREMA Manual for Railway Engineering."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.010	8.2.3	DMcL	03/22/22	Is the last paragraph required , i.e. where is there likely to be a change in track modulus on the project	05/13/22	MM	C	Yes. The DTX project includes at-grade trackwork including at-grade crossings for the turnback track.	06/27/22	BCC	Is this not a temporary situation ? Can a temporary non compliance not be put in place until the final construction is completed. Will the 'At Grade Crossings' not be on concrete ties ? If it is on slab I would expect to see a typical transition zone design.	10/3/2022	MJS	There will be a transistion in track modulus from the at-grade, ballasted concrete ties to the U-wall and tunnel (mined and cut-and-cover sections) direct fixation.	10/3/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 109
Comments Closed 109
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 08, Trackwork*		
Document date:	*2/28/2022*		

Reviewers

Name	Initials	Name	Initials
Frank Blachly (Design Team)	FB	David Fung (Design Team/Robin Chiang & Co.)	DF
L. Godbold (Design Team)	LDG	Stephen Metz (Design Team)	SM
Chukwuma Umolu (Design Team)	CU	Pedro Gutierrez (Caltrain)	PCG
Rick Bartholomew (Caltrain)	RB	Bin Zhang (Caltrain)	BZ
Douglas McLoud	DMcL	M. Brunner (CHSRA)	MBr
Luis Zurinaga (SF CTA)	LZ		
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.011	8.2.4.and 8.2.5	DMcL	03/22/22	Where is the location that ballasted track will be required. I feel that the 2 sections could be expanded and the minimum depths added as a minimum	05/12/22	MJS	C	Ballasted track will be used for the at-grade portion of the alignment (Main line, Maintenance of Way, and Turnback Track) except for at-grade crossings at 16th Street and Mission Bay Drive. These sections refer to Caltrain Design Criteria and the specific sections that describe the Caltrain requirements.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.012	8.2.6	DMcL	03/22/22	Is there any special trackwork on ballasted track	05/13/22	MM	DE	Yes, the design is still being progressed, but there is special trackwork on ballasted track.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.013	8.2.8	DMcL	03/22/22	Is Other Track Material the correct heading to use for this section	05/12/22	MJS	A	Renamed Section header title to "Track Material Performance Requirements"	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.014	8.2.8.1	DMcL	03/22/22	Fastening systems have already been mentioned with concrete ties and should be removed from this sub section. Don't see fastening systems as OTM or System Safety and Reliability	05/12/22	MJS	B	Agreed that fastening system is already mentioned, but this subsection is discussing safety and reliability.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.015	8.3	DMcL	03/22/22	This section could be rationalized concentrating on the units that will be used. Perhaps a table showing type and location.	05/12/22	MJS	C	A table is of little benefit at this stage with minimal information.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.016	8.3	DMcL	03/22/22	For the crossovers on the 650 feet radius curve there should be a risk assessment carried out for its suitability to be positioned on the curve.	05/12/22	MJS	B	CHSRA has already agreed to the absolute minimum radius of curvature (650') as stated in DVR_0001. The curved crossover in the 650 radius curve is for Caltrain use-only as it provide access to the Caltrain platform.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.017	8.5.1	DMcL	03/22/22	Its section 5.8, not 5.9 and this should mention that the lubricators will be positioned in accordance with the manufacturer. I do not think that AREMA should be mentioned as the manufacturer would have had to get their product accepted for use by AREMA. AFFECTS: Caltrain and CHSRA	05/25/22	MM	A	Agree, lubricators must be installed per manufacturer's requirements. AREMA provides recommended practices, not standards.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.018	8.5.1	DMcL	03/22/22	Are the tracks bi-directional here as a lubricator would be required at both ends and this needs to be stated if so. AFFECTS: Caltrain and CHSRA	05/19/22	MM	A	Updated text per recommendation.	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
HSR.019	8.5.2	DMcL	03/22/22	Will each platform track have a bumping post at the termination of the track and will a risk assessment be carried out as to the position of these beyond the end of the train stop. Is there not a design criteria for Bumping Posts that the designer needs to follow AFFECTS: Caltrain and CHSRA	05/19/22	MM	A	Agree. Replaced text to provide a performance standard in line with the CHSRA criteria as follows: "Bumping posts must be designed to protect passengers and crew on the train, adjacent trains, and the platforms in the event of an over-run. The design must consider the track configuration, maximum likely speed, and rolling stock characteristics."	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
HSR.020	8.2.7	DMcL	03/22/22	What is the significance of placing guard rails at the end of CAHSR platforms and not others. Will a continuous check rail (restraining rails) not do the same job. Where did the 25 feet length come from ? AFFECTS: CHSRA	05/12/22	MJS	A	CHSRA platforms are high platforms which mitigate need for guard rail. Restraining rail will be used in the transit center. Will allow the use of restraining rails in section 8.6.1 since the term guard rail is sometimes used for restraining rail, will clarify terminology in the Design Criteria for the purpose of this project as follows: "restraining rails provide a narrow flangeway (1 5/8") to avoid derailment of a train through a tight radius curve (typically radius less than 500'). Guard rails are located further away from the running rails (10" gap) and attempt to control the movement of a derailed train. Guard rail typically are installed at raised portions of track or at the approaches to tunnels or structural elements that need protection." The 25 feet length was included in the original release of the DTX Design Criteria (2009).	05/25/22	ROK		05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
HSR.021	8.6.2	DMcL	03/22/22	Is there an actual requirement for derails based on the location for this project bearing in mind what their function is for. (CFR 213.357 states that each track other than a main track which connects to class 7,8 or 9 main track shall be equipped.) AFFECTS: Caltrain and CHSRA	05/19/22	MM	C	Section has been updated to reference Caltrain Design Criteria Chapter 2 - Track, Part D - Special Trackwork. There are at-grade maintenance-of-way and turnback tracks that are part of the DTX project.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.022	8.7	DMcL	03/22/22	What reconfiguration will be happening and at what Grade Crossing	05/19/22	MM	C	Locations referenced in first paragraph. The at-grade interlocking will be updated to provide a connection to both the DTX tracks and the Fourth and King Station.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.023	Section 8.3, 8-4	MBr	10/01/18	LEGACY Comment HSR18.045 - 8.3 Special Trackwork (Turnouts and Crossovers) CHSR trainsets cannot utilize No 8 & No. 9 turnouts	02/28/22	MJS	A	Turnouts No. 8 and No. 9 will not be used for mainline tracks nor for any CHSRA-train movements. Revised bullet to read as follows: "No. 8 and No. 9 lateral turnouts may be used in yard and non-revenue tracks where only Caltrain rolling stock will operate."	05/09/22	ROK		05/09/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from CHSRA, thus the comment is considered closed.	05/09/22	CC
TA.001	Section 8.5.1, Rail Lubrication (First bullet)	LZ	07/04/22	Refers to approach to the DTX between 7th and Townsend sts. Should be "approach to the 4th and Townsend station", since the section between 7th and Townsend is already part of the DTX	09/02/22	MJS	A	Revised section as follows: "Train-activated rail lubricators must conform with AREMA (Volume 1 – Track, Chapter 5, Part 5, section 5.9 Wayside Lubrication of Rail on Curves and the manufacturer's recommendations. The design and location of lubricators must and include an analysis to ensure the following locations are provided with sufficient lubrication to be installed at both ends of each curve on all tracks to lubricate the following locations to prevent excessive rail wear and provide noise abatement: •Curved approach to the DTX between Seventh and Townsend streets •Curved transition between Townsend and Second streets •Throat structure approach to the Transit Center directionRail lubricators located below grade must be designed to support remote monitoring, electronic type functioning system, and provide containment of the lubricant in case of malfunction or rupture of a hydraulic hose or valve.				9/27/2022	MJS	The PMPC Team met with Caltrain and the Design Team for a CRM held on 9/27/2022 where this isue was resolved.	9/27/2022	CC
TA.002	Section 8.7, At-Grade Crossings	LZ	07/04/22	Sentence needs to be restructured for clarity	09/02/22	MJS	A	Revised as noted.				9/27/2022	MJS	The PMPC Team met with Caltrain and the Design Team for a CRM held on 9/27/2022 where this isue was resolved.	9/27/2022	CC

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Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 09, Geotechnical Requirements*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Marguerite Bello (Design Team)	MB	Jim French (Design Team)	JF
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Meghan Murphy (PMPC/AECOM)	MM
Amanda Kaku (PMPC/HCI)	AK		

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GEC.001	Design Criteria, Chap. 9	JF	03/17/22	See tracked changes and review comments in "Chapter 09_Geotechnical Requirements jf.docx"	04/25/22	MJS	C	See comments #GEC.012-GEC.059	05/17/22	ROK					05/17/22	CC
GEC.002	Chapter 9 - Geotechnical Requirements	MB	03/18/22	See tracked changes and review comments in "Chapter 09_Geotechnical Requirements with MB comments.docx"	04/25/22	MJS	C	See comments #GEC.061, GEC.062	05/17/22	ROK					05/17/22	CC
GEC.003	Chapter 09_Geotechnical Requirements, 9.1.2, page 9-5 of 12	YS	03/17/22	Suggest clarifying specific types of seismic tests required for rock explorations.	05/12/22	MJW	A	Agree, will clarify "seismic tests" to mean "downhole P-S log by OYO method or equivalent to collect shear wave and p-wave velocities in the rock."	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.004	Chapter 09_Geotechnical Requirements, 9.1.2, page 9-5 of 12	YS	03/17/22	Suggest including requirements for performing tests which would determine in horizontal situ stresses using hydraulic fracturing, over coring, or flat jack method.	05/12/22	MJW	A	Agree, will add in situ stress evaluations by ISRM (40, 2003) double packer test method, over coring by ASTM D4623, and/or flat jack testing by ASTM D4729.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.005	Chapter 09_Geotechnical Requirements, 9.1.9, page 9-7 of 12	YS	03/17/22	Suggest including requirements for performing direct shear tests on rock defects or joints to determine shear strength parameters of defects or joints.	05/12/22	MJW	A	Noting that the ASTM has been withdrawn, we will add a reference to testing strength of rock discontinuities via ASTM D4554-12.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.006	Chapter 09_Geotechnical Requirements, 9.2, page 9-8 of 12	YS	03/17/22	In GIR, the design parameters should include those for rock discontinuities such as joint spacing, dip angle, and dip directions, as well as those for seismic design such as shear wave velocity and dynamic strength parameters of soil and rock units.	05/12/22	MJW	A	Agree, will include bullet points for "design parameters for rock and rock discontinuities such as joint spacing, dip angle, and dip directions" and "seismic design parameters such as shear wave velocity and dynamic strength parameters of soil and rock units, and stiffness reduction curves for dynamic loading"	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.007	Chapter 09_Geotechnical Requirements, 9.2, page 9-8 of 12	YS	03/17/22	In GIR, the ground deformations or settlements as a result of groundwater drawdown if occurring due to excavation should be addressed.	05/12/22	MJW	A	Agree, will include a bullet point requiring evaluation of effects of groundwater drawdown.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.008	Chapter 09_Geotechnical Requirements, 9.2, page 9-8 of 12	YS	03/17/22	GBR is an important contractual document. Suggest providing more detailed guidance on the contents of this document, which should be covered.	05/12/22	MJW/ MM	A	We agree with this comment. However, the method of procurement has not yet been fully finalized, and thus the specificity we can provide at this time on the GBR contents may be inappropriate (if for example the procurement is progressive design-build, it may be a different set of contents than for a traditional design-build). The Gold book has a significant list of required contents for a GBR. Repeating that list would add redundancy so we will make a stronger reference to the list (starting from page 22 of the book) in the DCM. Revised to read as follows: "A GBR must be prepared for the mined tunnel portion of the project only, in accordance with the recommendations and list of required contents from the Underground Technology Research Council (ASCE 2007). "	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.009	Chapter 09_Geotechnical Requirements, 9.6.2, page 9-11 of 12	YS	03/17/22	For clarity, list in-tunnel convergence targets as part of ground movement measuring devices.	05/12/22	MJW	A	Agree will add tunnel convergence monitoring devices to list of instrumentation.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.010	Chapter 09_Geotechnical Requirements, 9.6.3, page 9-12 of 12	YS	03/17/22	Automatic data collection will not be limited to groundwater readings and should include MPBXs, surface settlements, utility settlements, etc. An online website for automatic data collection should be established for allowing monitoring the data and readings 24/7.	05/12/22	MJW	A	Agree and will revise this section, but potentially not in the way the reviewer would anticipate. Specification of monitoring frequency for the overall monitoring system will be reserved for either a spec or a technical requirement narrative. For the Design Criteria, this groundwater monitoring was meant more for what the designers would do during design development. This must be clarified here - transmittals every 2 weeks would be okay during design, but agree that during construction, data transfer would happen in real time and be hosted/displayed via an online system. The requirement for such a system is outside the scope of a design criterion. Revised to read as follows: "Monitoring schedules for each type of instrument installed must be established. The data must be submitted bi-weekly (during design) and real-time (during construction) to the TJPA for assessment to allow time for corrective action, if necessary."	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.011	Chapter 9 - Scope, ¶2-4	JF	03/17/22	Revise last sentence to read as follows: ".. Alone make these documents contractually reliable."	05/12/22	MJW	A	Agree, added word "contractually" to sentence.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.012	Chapter 9 - Scope, ¶3-1	JF	03/17/22	Move sentence from below to "Scope" section: "The subsections that follow specify the appropriate application of these codes, standards, guidelines, and references. Geotechnical investigations and analysis must be sufficient to obtain permits for the work."	05/12/22	MJW	A	Revised as noted	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.013	Chapter 9 - Codes, Standards and Guidelines, ¶1, Third bullet	JF	03/17/22	This is ASTM 4.08 (previous entry), so may not need to be relisted here	05/12/22	MJW	A	Agree, will remove redundant listing.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.014	Chapter 9 - References	JF	03/17/22	Add new sub-section header "Project-Specific Reference Documents"	05/12/22	MJW	A	Agree, added.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.015	9.1 - Subsurface Exploration and Testing, ¶1, First bullet	JF	03/17/22	Revise to read as follows: "Boreholes, utilizing standard penetration tests (SPTs) and other sampling methods.." This clarifies that "SPT" is a type of sampler rather than a type of borehole	05/12/22	MJW	A	Revised as noted	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.016	9.1 - Subsurface Exploration and Testing, ¶1, Second bullet	JF	03/17/22	Add "(CPTs)" acronym	05/12/22	MJW	A	Revised as noted	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.017	9.1 - Subsurface Exploration and Testing, ¶2-2,3	JF	03/17/22	It is a little awkward to switch here to the imperative mood from the "mode of obligation." (E.g., previous sentences has "… testing must suit…") I suggest sticking with one of the modes of obligation (shall or must) and not to use imperative for a Design Criteria.	05/12/22	MJW	A	Revised to passive voice	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.018	9.1 - Subsurface Exploration and Testing, ¶4-1	JF	03/17/22	Revise first sentence to read as follows: ".. must be submitted to the TJPA for review and approval; see Chapter…" I think the Design Criteria should bind the GEC, not the TJPA	05/12/22	MJW	A	Revised to passive voice	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.019	9.1.1 - Soil Explorations, ¶1-1	JF	03/17/22	Revise first sentence to read as follows: "Explorations within soil units must include an appropriate selection from the following methods:"	05/20/22	MJW	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.020	9.1.1 - Soil Explorations, ¶1, First Bullet	JF	03/17/22	Revise first bullet: "Rotary wash borings:"	05/12/22	JL	A	Agree. deleted "through" and add a colon (:)	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC

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Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
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GEC.021	9.1.1 - Soil Explorations, ¶1, Second and Third bullets	JF	03/17/22	Revise bullets to read as follows: oSoil sampling generally about once every 5 feet and at layer changes, with continuous sampling performed on an as-needed basis. Sampling may be increased generally to once every 10 feet and at layer changes outside of the tunnel horizon, defined as the tunnel section, and one diameter above and below the tunnel. Soil must be logged in accordance with the Caltrans Soil and Rock Logging Manual. oUndisturbed and relatively undisturbed sampling of cohesive materials. Where possible, use Osterberg or Dames & Moore piston sampler instead of Shelby tube sampling for soft to stiff cohesive materials.	05/20/22	MJW	B	Agree, will add "about" and switch "can" to "may" in first bullet. Disagree with adding Osterberg as an option in soft- to stiff materials. The D&M sampler has been shown to reduce sample disturbance in this locality better than other samplers of larger diameter (e.g. 101.6mm) because the sample preparation needed for the D&M is reduced (i.e. the sample fits right in the ring rather than requiring trimming). This is consistent with John Bray's methodology paper from June 2020 prepared for NZ Ministry of Business Innovation and Employment.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.022	9.1.2 - Rock Explorations, ¶1-1	JF	03/17/22	Revise first sentence to read as follows: "If bedrock is encountered.."	05/12/22	JL	A	Agree. swapped 'rock' with 'bedrock' only at this phrase, 'If rock is encountered...'.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.023	9.1.2 - Rock Explorations, ¶1, below second bullet	JF	03/17/22	Add the following sentence: "As part of the above-described explorations, an appropriate number of the following tests should be performed to adequately characterize the bedrock:" Above drilling methods are drilling methods, below are test methods within those explorations	05/12/22	JL	A	Agree. will add the sentence accordingly.		08/05/22	BCC	Sentence is still missing	09/01/22	JL	The sentence has been added.	09/30/22	CC
GEC.024	9.1.2 - Rock Explorations, ¶1, Third bullet	JF	03/17/22	Revise to read as follows: "Rock deformability (dilatometer and/or pressure-meter tests)"	05/12/22	JL	A	Agree. revised accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.025	9.1.2 - Rock Explorations, ¶1, Sixth bullet	JF	03/17/22	Revise to read as follows: "Acoustic televiewer and/or optical logging"	05/12/22	JL	A	Agree. revised accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.026	9.1.3 - Core Logging in Soil and Rock, ¶1-1&2	JF	03/17/22	Revise to read as follows: "A California-licensed geotechnical engineer or certified engineering geologist must continuously monitor the drilling and coring procedures, visually classify the rock core, or soil samples obtained, and prepare a field borehole log. There must be at least one geotechnical engineer or engineering geologist for each drilling rig."	05/12/22	JL	A	Agree. revised accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.027	9.1.3 - Core Logging in Soil and Rock, ¶1-4	JF	03/17/22	Does this intend to mean a CEG is needed to review soil classification performed by a GE? If not, this should be re-worded.	05/12/22	JL	C	We think the reviewer refers to this sentence, 'An experienced certified engineering geologist must also be on site to verify the classification of recovered rock and soil materials and aid on-site engineers, geologists, or other personnel.' Yes, an experienced CEG must be on site for the verification. No revision is needed.		05/17/22	ROK					05/17/22	CC
GEC.028	9.1.3 - Core Logging in Soil and Rock, ¶2-1	JF	03/17/22	Suggest re-wording away from imperative mood.	05/12/22	JL	A	Agree. will reword as follows "At the end of each day, rock cores must be placed in plastic core bags or double-wrapped in plastic wrap, which are then, placed in wooden core boxes, and transported to a storage facility."		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.029	9.1.3 - Core Logging in Soil and Rock, ¶2-3	JF	03/17/22	Rephrase "Photograph" in the imperative	05/12/22	JL	A	Agree. will reword as follows "The cores must be photographed; at least one photo for each core box and closeups of special features such as..."		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.030	9.1.3 - Core Logging in Soil and Rock, ¶2-4	JF	03/17/22	In reference to "the geologist's" - Previous paragraph indicated a GE or CEG could log; no mention was made for a non-CEG geologist (PG).	05/20/22	MJW	A	Agree, will revise to add the word "engineering" in front of "geologist."					8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.031	9.1.4 - Cone Penetration Tests, ¶1-1	JF	03/17/22	Revise to read as follows: "...ASTM standards, and the equipment must be capable.."	05/12/22	JL	A	Agree. will revise it accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.032	9.1.4 - Cone Penetration Tests, ¶3-1	JF	03/17/22	Remove "Excess" from beginning of sentence Normally referred to as a dissipation test (without "excess"); in some dense dilative soils pore pressures may increase for a while.	05/12/22	JL	A	Agree. will revise it accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.033	9.1.4 - Cone Penetration Tests, ¶4-1	JF	03/17/22	Revise to read as follows: "Interpretation of CPT results must follow the procedures described in "Guide to Cone Penetration Testing for Geotechnical Engineering," by Robertson & Cabal, 5th Edition, July 2012.	05/12/22	JL	A	Agree. will revise it accordingly.		08/05/22	BCC	Latest edition is the 6th Edition, 2015. Recommend update reference to 2015	09/01/22	JL	Agreed and revised the reference accordingly.	10/03/22	CC
GEC.034	9.1.5 - Field Vane Shear Tests, ¶1-2,3,4	JF	03/17/22	Revise to read as follows: "Test should usually be performed.." Small intervals may not always be appropriate, e.g., if a sand zone is encountered within Bay Mud.	05/12/22	JL	A	Agree. will revise it accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.035	9.1.6 - Ground Monitoring, ¶1-1	JF	03/17/22	Replace "completed" with "performed" If it is recurrent it may be on-going and never be "complete"	05/12/22	JL	A	Agree. will revise it accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.036	9.1.6 - Ground Monitoring, ¶1-2	JF	03/17/22	In reference to "monitor" - Use imperative mood throughout subsection	05/12/22	JL	A	Agree. will reword as follows "Where possible, the groundwater levels must be monitored in each borehole. If accurate... obscures groundwater levels, a secondary shallow hole must be drilled next to the (primary) borehole... Upon completion... both boreholes must be backfilled with cement grout..." ... "Piezometers, multilevel piezometers, monitoring wells, and pumping wells must be installed at selected locations..., and permeability testing must be conducted."		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.037	9.1.6 - Ground Monitoring, ¶1-3	JF	03/17/22	Revise to read as follows: "If accurate groundwater levels cannot be measured at the time of drilling because the use of drilling mud obscures groundwater levels, it may be appropriate to drill a secondary.." Suggest this not be mandatory for all borings. With utility clearances and traffic control requirements a second boring may be more costly than it is worth	05/20/22	MJW	A	Agree. Sentence will be deleted. However, this triggers several revisions critical for monitoring groundwater. First, we will require that groundwater monitoring capability be installed at all boreholes. Considering the litigation risk that groundwater has posed to other infrastructure in the vicinity, we will mandate that standpipe piezometers or vibrating wire piezometers be installed at any borehole drilling opportunity, unless there is already a groundwater monitoring device available within 100 feet horizontally and 25 feet vertically.		08/05/22	BCC	Sentence is still there and none of the proposed text is currently included.	09/02/22	MJW	Text modified and updated in "Groundwater Monitoring" section.	10/03/22	CC
GEC.038	9.1.9 - Laboratory Testing, ¶3-2	JF	03/17/22	Revise to read as follows: "Cerchar Abrasivity Index Soil abrasion testing (ASTM D7625) must also be conducted in units that classify as sands or gravels." Suggest not using European standards.	05/12/22	MJW	A	Will add 'Cerchar Abrasivity Index Soil abrasion testing (ASTM D7625)' and leave as an option for either testing.					8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.039	9.1.9 - Laboratory Testing, ¶4-1	JF	03/17/22	Replace "density, porosity, " with "unit weight"	05/12/22	JL	A	Agree. will revise it accordingly.		05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.040	9.1.9 - Laboratory Testing, ¶6-2	JF	03/17/22	Remove second sentence	05/20/22	MJW	B	Disagree. This is geared to a design-build framework and it is important that the TJPA indicate that this is the designer's responsibility, not that of the TJPA.					8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.041	9.1.9 - Laboratory Testing, ¶6-3,4	JF	03/17/22	Revise to read as follows: "Rock abrasion testing using the Cerchar Abrasivity Index test (ASTM D7625) must may also be conducted. Mineralogy and petrographic analysis, and must be evaluated for each rock type. Representative samples of rock identified as containing asbestiform must be submitted for X-ray diffraction testing to evaluate for the presence of asbestos fibers."	05/20/22	MJW	A	Agree to add the option for Churcher testing but will not remove the option for SINTEF. As this will be procured design-build this must be left to the designer to select based on the preference of their tunnel contractor.					8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 104
Comments Closed 104
% Complete 100%

Document Control File Code:

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 09, Geotechnical Requirements*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Marguerite Bello (Design Team)	MB	Jim French (Design Team)	JF
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
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Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Meghan Murphy (PMPC/AECOM)	MM
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GEC.042	9.2 - Geotechnical Reporting (Geotechnical Data Report), Fifth bullet	JF	03/17/22	Remove "with offset from profile centerline following the format of the Caltrans Log of Test Borings" Stick-log profiles have been presented but not in LOTB format	05/20/22	MJW	A	Agree to remove the "following the format of the Caltrans Log of Test Borings" but we do want to see the station and offset information on the fence diagram.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.043	9.2 - Geotechnical Reporting (Geotechnical Interpretive Report), Tenth bullet	JF	03/17/22	Revise to read as follows: "Evaluation of ground deformations that may be caused by excavations, and the impacts of this on existing adjacent structures"	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.044	9.2 - Geotechnical Reporting (Memoranda), ¶1	JF	03/17/22	Remove first paragraph - not needed as a deliverable?	05/20/22	MJW	B	Disagree. We want the DB team or the preliminary engineering team to compile this document. That way all the reference geotechnical reports even tangentially related or available or relevant for the project are captured in one body of work.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.045	9.2 - Geotechnical Reporting (Geotechnical Baseline Report), ¶1-2	JF	03/17/22	Revise sentence to read as follows: "The GBR will serve as a summary.."	05/20/22	MJW	B	Standard is to write the DCM in the present tense.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.046	9.3 - Gound Improvement Methods, ¶2-2	JF	03/17/22	Revise to read as follows: "Proposed analytical and design methods for these specialized techniques must be submitted for approval by the TJPA.	05/12/22	JL	A	Agree. will revise it accordingly.	08/05/22	BCC	Editorial: The sentence in the DTX Design Criteria Rev Book 02 - Draft Final has an extra period (punctuation).	09/01/22	JL	checked no extra period in the sentence.	10/03/22	CC
GEC.047	9.3 - Gound Improvement Methods, ¶4-1	JF	03/17/22	Revise to read as follows: "..temporary unless demonstrated to be capable of performing throughout the project design life and accepted by the TJPA."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.048	9.4 - Excavation Base Stability, ¶2-3	JF	03/17/22	Revise to read as follows: "Achieving this factor of safety may require groundwater lowering by dewatering, use of relief wells, or ground improvement below the excavation subgrade to increase the soil strength and resistance against uplift, or a combination of these methods."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.049	9.5 - Groundwater Control, ¶1-1	JF	03/17/22	Revise to read as follows: "..lowering the groundwater, where necessary.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.050	9.5 - Groundwater Control, ¶1-3	JF	03/17/22	Revise to read as follows: "The potential extent of groundwater drawdown around the site caused by dewatering of the site must be.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.051	9.5 - Groundwater Control, ¶2-1	JF	03/17/22	Revise to read as follows: "The necessary tests must be performed to evaluate the anticipated quality and quantity of groundwater to verify that the discharge will meet the San Francisco Public Utilities Commission's (SFPUC) criteria for disposal of groundwater from dewatering into the sewer system." Use imperative mood ("design")	05/12/22	JL	A	Agree. will revise it accordingly. Also, the last sentence of the paragraph will be reworded as follows, "If necessary, on-site treatment must be designed to improve the quality of the discharge to meet the SFPUC criteria for disposal in the sewer system."	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.052	9.6 - Instrumentation and Monitoring, ¶1, first bullet	JF	03/17/22	In reference to "the project area" - Is "the project area" defined in another chapter? It probably should be defined in this chapter (first occurrence in §9.1.6).	05/12/22	JL	A	To be revised by PMPC Team	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.053	9.6 - Instrumentation and Monitoring, ¶4-2	JF	03/17/22	Revise to read as follows: "..must be designed to employ at least two independent measurements.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.054	9.6 - Instrumentation and Monitoring, ¶5-1	JF	03/17/22	Revise to read as follows: "..refer to Specification Section 31 09 13.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.055	9.6.2 - Ground Movement Measuring Devices (Surface Movement Markers), ¶1-3	JF	03/17/22	Revise to read as follows: "..is used to detect settlements that may be masked by the bridging.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.056	9.6.2 - Ground Movement Measuring Devices (Inclinometers), ¶1-2	JF	03/17/22	Revise to read as follows: "Inclinometers may be attached to boreholes, the reinforcing cages of walls, or the soldier beams.."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.057	9.6.2 - Ground Movement Measuring Devices (Optical Surveys), ¶1-2	JF	03/17/22	Revise to read as follows: "Optical surveys are used to monitor the vertical and horizontal movement of.."	05/12/22	JL	A	Agree. will revise it accordingly.	08/05/22	BCC	Editorial: The sentence in the DTX Design Criteria Rev Book 02 - Draft Final has an extra period in middle of sentence (punctuation).	09/01/22	JL	Removed the extra period in the middel of the sentence.	10/03/22	CC
GEC.058	9.6.3 - Monitoring Schedules, ¶1-3	JF	03/17/22	Revise to read as follows: "..as dataloggers with remote communication capabilities, must be collected no less frequently than once per hour."	05/12/22	JL	A	Agree. will revise it accordingly.	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.059	9.6.4 - Deformation Trigger Levels, ¶2-1	JF	03/17/22	Replace "will" with "must" and "deformation" should be pluralized	05/10/22	MJW	A	To be revised by PMPC Team	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.060	9.2 - Geotechnical Reporting (Geotechnical Interpretive Report), Fourth bullet	MB	03/03/22	Maximum and minimum, including expected floods, tides, and sea level rise, etc.	05/20/22	MJW	A	An additional bullet can be added indicating the hydraulic design inputs received for geotechnical consideration, such as flood elevation, tidal variation, and sea level rise (cannot put "etc." in a list, either have to be exhaustive of what we want or not at all). But these parameters are defined by other disciplines, not by geotechnics.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.061	9.2 - Geotechnical Reporting (Geotechnical Interpretive Report), Ninth bullet	MB	03/03/22	Including pile capacities (flexural, shear, deformations) and stiffnesses, for compression and tension loads	05/20/22	MJW	B	Agree that these would be provided in a GIR document. However, this level of specificity is not consistent with the other items in the list. Commentator's requested pile capacities are required by other design requirements such as the California Building Code or AASHTO HDM 8 with Caltrans Amendments, or the standard of care for geotechnical deliverables. As this interface would be a request between the design-builder's geotech an structural designers, no change proposed.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.062	Chapter 9	SMi	09/12/16	LEGACY Comment GEC16.046 - Should this section include the geotechnical design criteria for foundations, support of excavation, underpinning, and soil-structure interactions, etc.?	05/04/22	AG	C	Per the Scope section (pg. 9-1): "This chapter does not provide specific design parameters. Because of the variability in ground conditions along the DTX alignment, the design parameters have been developed from site-specific subsurface investigations and laboratory testing programs. The geotechnical data and design parameters are presented in the geotechnical reports referenced herein."		ROK					05/04/22	CC
GEC.063	Section 9.1	PC	09/12/16	LEGACY Comment GEC16.047 - First bullet item: Boreholes (Standard Penetration Tests, SPT)	05/04/22	AG	A	Added.		ROK		05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.064	Section 9.2	SM	09/12/16	LEGACY Comment GEC16.048 - It should be clearly stated what the differences and usages of GDR, GBR and GRR are with regard to the contract document hierarchy. Detailed requirements and contents of the GBR shall be added. It says "A GBR shall be prepared for the mined tunnel~". Should the GBR be prepared for the entire project alignment? Please clarify this. Please specify the recommendations from ASCE/SME. Are these referring to "Geotechnical Baseline Reports for Construction – Suggested Guidelines (Essex, 2007)?	05/04/22	AK	C	Will add descriptive language for each of the reports. As a note, "GRR" is now referred to as the "GIR." Regarding the GBR: The limits will be determined based on the contract package strategy selected at a later time.		ROK					05/04/22	CC

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Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
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Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Meghan Murphy (PMPC/AECOM)	MM
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GEC.065	Section 9.4	PC	09/12/16	LEGACY Comment GEC16.049 - This section is ok and very general. Knowing how sensitive the ground condition is north of the SEM section, I am wondering if we should limit global dewatering in certain section.	05/04/22	MJW	A	DCM to be updated to reflect a damage criterion associated with groundwater management.		ROK		05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.066	Section 9.5	PC	09/12/16	LEGACY Comment GEC16.050 - Is there a specific threshold design table that TJPA want to follow? We should clearly refer to the table (assume it will be in Ch. 10) as design criteria at the end.	05/04/22	AK	A	The design of the geotechnical instrumentation used in the project is specified in the project specifications, Section 31 09 13. A reference to this section will be added in the Design Criteria.		ROK		05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.067	Section 9.2	SMi		LEGACY Comment GEC18.040 - It should be clearly stated what the differences and usages of GDR, GBR and GRR are with regard to the contract document hierarchy. Detailed requirements and contents of the GBR shall be added. It says "A GBR shall be prepared for the mined tunnel~". Should the GBR be prepared for the entire project alignment? Please clarify this. Please specify the recommendations from ASCE/SME. Are these referring to "Geotechnical Baseline Reports for Construction – Suggested Guidelines (Essex, 2007)?	05/04/22	AG	C	Repeat of 2016 comment #48.		ROK						
GEC.068	DC 9.2	PC		LEGACY Comment GEC18.041 - GBR: Do we limit the preparation of GBR to only mined tunnel? Or we should include cut and cover tunnel including station and vent shafts, etc. GRR: Should we change the terminology of GRR to GIR (Geotechnical Interpretive Report) to be consistent with what we have (see DC 4.8.1)?	05/04/22	AK	A	GBR: Similar comment to GEC16.048. GRR: Yes. Will change references to GRR to GIR.		ROK		05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.069	Sect. 9.2, GRR	YS		LEGACY Comment GEC18.042 - Please clarify that in the GRR, parameters for design of tunnel support in rock such as joints and discontinuities orientation and spacing, strength, and bond strength of soil nail and rock anchor design should be provided.	05/04/22	AK	C	The GRR is now known as GIR; it does not include design recommendations for the mined tunnels, but instead provides recommendations for soil properties to be used as a basis for the design. More details are provided in the design memorandum by Jacobs on numerical analysis of tunnel excavation and support methods, Task No. 7.03, dated February 18, 2010.		PAR	The rock mass parameters for mined tunnel design are derived by MJA in its ground characterization TM. But MJA still needs guidance from Wood on the properties of rock discontinuities as stated in the comment.	05/20/22	MM	This is a design team coordination issue, no edits required to the design criteria.	05/20/22	CC
GEC.070	DC 9.3	PC		LEGACY Comment GEC18.043 - Suggest adding "compensation grouting" to one of the techniques.	05/04/22	AG	A	Added.		ROK		05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.071	Sect 9.5.4, 2nd paragraph	YS		LEGACY Comment GEC18.044 - It is a common practice that the trigger levels are specified on contract drawings instead of in specifications. Suggest changing "specifications" to "contract documents".	05/04/22	AG	A	Revised.		ROK	No additional comment	05/04/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/04/22	CC
GEC.072	Chapter 9 Header	KB	08/03/22	Geotechnical' is misspelled in the header on each page with the 'n' and 'i' flipped.	09/01/22	JL	A	Editorial – PMPC Team will update.				09/02/22	MJW	I did a replace all of "geotechincal" for "geotechnical" and found one instance.	10/03/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 104
Comments Closed 104
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 09, Geotechnical Requirements*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Marguerite Bello (Design Team)	MB	Jim French (Design Team)	JF
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Meghan Murphy (PMPC/AECOM)	MM
Amanda Kaku (PMPC/HCI)	AK		

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.001	9.1.1 - 3rd bullet	MF	03/30/22	CA HSR will not allow rotasonic drilling in soil as this drilling method retrieves a continuous but highly disturbed sample allowing only index lab testing. Rot sonic is not appropriate for most soil conditions except unconsolidated gravels and cobbles which are not anticipated in downtown SF.	05/20/22	MJW	B	Agree with the reviewer that the resulting sample is highly disturbed and not useful for laboratory testing that requires undisturbed samples. However, the method has advantages in its ability to advance through rubble-laden fill material, intermediate geomaterial, or soils typical of the vicinity to procure larger volumes of soils for tunnel abrasivity testing or environmental characterization. The methods of drilling must be left up to the design builder and the DCM permits TJPA to comment on the work plan if a designer proposes using vibracore-procured samples for undisturbed testing.	06/27/22	ROK	Ok	05/20/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/20/22	CC
HSR.002	Chap 9 - Geotechnical Requirements	MF	03/30/22	Many other geotechnical aspects are not discussed in this chapter, for instance settlement, foundation, earthwork criteria.	05/20/22	MJW	C	Agree with the reviewer's comment. These are provided as standard of care and required by governing codes and standards. Repeating the requirements would potentially create conflicts with those codes.	06/27/22	ROK	Ok				05/20/22	CC
HSR.003	Chap 9 - Geotechnical Requirements	MF	03/30/22	A cross reference to Chap 11 should be included as there are several geotechnical related requirements discussed in Chap 11 - groundwater, lateral earth pressures, excavation support and underpinning.	05/20/22	MM	A	To be revised by PMPC team if a reference to Chapter 11 should be included in, say, the introduction including "Attention is drawn to additional provisions of geotechnical seismic design identified in Chapter 13, and other areas of the DCM."	06/27/22	ROK	Ok	05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
HSR.004	9.1.1.	MF	03/30/22	Shear wave velocity needs to be collected to sufficient depth to establish a reference horizon for site response analysis required by Chapter 13 - Seismic. Consider whether guidance or requirements related to depth and frequency of shear wave velocity measurements in order to obtain adequate ground motions for the project.	05/20/22	MJW	A	Agree. Will modify §9.1.7 in accordance with other comments and this to include requirement that, " Shear wave and P-wave velocity information must be collected to adequate depth to establish a reference horizon."	06/27/22	ROK	Ok	05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC

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Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
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Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Meghan Murphy (PMPC/AECOM)	MM
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Cal.001	Chapter 9	JP	04/29/22	experience qualification for the geotechnical engineer of record	05/20/22	MJW	A	GEOR will require approval by the TJPA who will establish the experience qualifiers				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.002	Chapter 9	JP	04/29/22	(bullet) FHWA Geotechnical Technical Guidance Manual (GTGM), 2007	05/20/22	MJW	A	Agree, will add GTGM, 2007				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.003	Chapter 9.1	JP	04/29/22	include; , depth,	05/20/22	MJW	A	Will revise first sentence of second paragraph to read as follows: "The number, depth, and locations of…"				05/20/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.004	Chapter 9.1.1	JP	04/29/22	capitalize; Cone Penetration Tests	05/16/22	AK	A	To be revised by PMPC Team	05/17/22	ROK		05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
Cal.005	Chapter 9.1.1	JP	04/29/22	(bullet) Soil Resistivity	05/20/22	MJW	C	This is covered by the sentence requiring corrosion testing near the end of 9.1.9. But can also add downhole e-logging to 9.1.7, as a permissive and modify the title "for modulus determination" to "for modulus or resistivity determination"							05/20/22	CC
Cal.006	Chapter 9.1.2	JP	04/29/22	revise; 'alternative sampling techniques must'	05/20/22	MM	A	Revised to read: "..alternative soil sampling techniques must be used instead of coring..".				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.007	Chapter 9.1.3	JP	04/29/22	with label; horizontal and vertical locations where core was taken, date, etc.	05/20/22	MJW	A	Agree, will include requirement that core boxes be labeled with this information.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.008	Chapter 9.1.9	JP	04/29/22	include; GTGM,	05/20/22	MJW	B	Disagree. This section refers to test method standards/procedures. While the GTGM refers test standards, it does not specify test procedures.				05/20/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.009	Chapter 9.2	JP	04/29/22	approved by geotechnical engineer of record	05/20/22	MJW	A	Not sure to which document this refers, but a requirement will be added that the GIR, calculation memoranda, and GBR must be stamped by the GEOR.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.010	Chapter 9.2	JP	04/29/22	(bullet) evaluation of in service performance of new structure(s) under predicted standard operations	05/20/22	JL	C	Not sure which section the reviewer is considering for the bullet item; don't think it fits into Section 9.2. Geotechnical Reporting. Please clarify.							05/20/22	CC
Cal.011	Chapter 9.2	JP	04/29/22	clarify; GIR includes 'all design parameters' which is contradictory	05/20/22	MM	A	Will revise and remove the word "all".				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.012	Chapter 9.4	JP	04/29/22	Basal Heave; subheading and number	05/20/22	JL	A	will revise 9.4 Excavation Base Stability as follows. "9.4 Excavation Base Stability Basal heave and hydrostatic analysis must be conducted for excavations for temporary and permanent facilities. 9.4.1 Basal Heave The evaluation of excavation stability against basal heave... ... and approved by the TJPA. 9.4.2 Hydrostatic Uplift The stability of the base of the excavation against hydrostatic uplift... ... and resistance against uplift."				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.013	Chapter 9.4	JP	04/29/22	Hydrostatic Uplift; subheading and number	05/20/22	JL	A	See the response to Cal.012 above.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.014	Chapter 9.4	JP	04/29/22	move geotechnical and TJPA approval to last sentence	05/20/22	JL	A	See the response to Cal.012 above. The sentence is now the last sentence of Section 9.4.1.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.015	Chapter 9.4	JP	04/29/22	reference standard or guideline used for factors of safety	05/20/22	JL	A	will add references as follows. "... Factors of safety against basal heave must not be less than 1.5 (e.g., Clough and O'Rourke, 1990),... " and "... The minimum factor of safety against hydrostatic uplift will be 1.3 (e.g., Bowles, 2001)." will add the following reference in the reference section. "Bowles, J.E. (2001). Foundation Analysis and Design, McGraw-Hill, USA." Clough and O'Rourke (1990) is already listed in the reference section so no need to add it.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.016	Chapter 9.5	JP	04/29/22	include; from dewatering	05/20/22	MM	C	Dewatering is included in this section.							05/20/22	CC
Cal.017	Chapter 9.6	JP	04/29/22	(bullet) monitor post construction service performance	05/20/22	JL	A	will add the fifth bullet point "Monitor post-construction performance"				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.018	Chapter 9.6	JP	04/29/22	refer to design parameters established in section 10.2	05/20/22	JL	C	Not sure what the reviewer is referring to for referencing.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.019	Chapter 9.6.1	JP	04/29/22	define for clarity	05/20/22	JL	C	Not sure what the reviewer is referring to for clarity.							05/24/22	CC
Cal.020	Chapter 9.6.2	JP	04/29/22	TJPA approval	05/20/22	MM	A	Agree, will add "and as approved by TJPA" to the end of the introductory sentence.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.021	Chapter 9.6.4	JP	04/29/22	and associated design parameter, reference section 10.2	05/23/22	MM	A	Agree.				05/23/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/23/22	CC
Cal.022	Chapter 9.6.4	JP	04/29/22	TJPA approval	05/20/22	MM	A	Agree, will add "and as approved by TJPA" to the end of section.				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.023	Chapter 9; (Page 9-3 of 13)	JP	07/12/22	Project-Specific Reference Documents; include: -Parsons; geotechnical reports -Slate; Seismic Hazard Analysis	09/02/22	MJW	C	Final Geotechnical Interpretive Report by Parsons (2010) is included in the reference list. Slate's seismic hazard analysis report is not needed as reference for this geotechnical section.				09/02/22	MJW	Reference to Slate's seismic hazard analysis added to seismic section, no change required, therefore comment is considered closed	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
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Comments Closed 104
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Document Control File Code:

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 09, Geotechnical Requirements*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Marguerite Bello (Design Team)	MB	Jim French (Design Team)	JF
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Sangyoon Min (Design Team)	SMi	Mitch Fong (CHSRA)	MF
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
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Matt Schreffler (PMPC/Mott MacDonald)	MJS	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Meghan Murphy (PMPC/AECOM)	MM
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TA.001	Section 9.1.1, Soil Explorations (first para)	LZ	07/04/22	States that "sampling may be increased", but the increase is in the distance between samplings, not the samplings themselves. should say that" sampling may be reduced"	09/01/22	JL	A	Agreed. revised the sentence as follows. Sampling frequency may be reduced generally to once every 10 feet and at layer changes outside of the tunnel horizon, defined as the tunnel section, and one diameter above and below the tunnel.				10/03/22	MJS	The responder (PMPC Team) agreed and addressed the original comment therefore it is considered closed.	10/03/22	CC
TA.002	Section 9.1.1, Soil Explorations (secondpara)	LZ	07/04/22	It says that a secondary monitoring hole "may be appropriate" and then says that a shallow hole "must be" drilled. Please clarify	09/01/22	JL	A	Revised as follows. it may be appropriate to drill a secondary shallow hole next to the (primary) borehole where sampling is being performed and...				10/03/22	MJS	The responder (PMPC Team) agreed and addressed the original comment therefore it is considered closed.	10/03/22	CC
TA.003	Section 9.6, Instrumentation and Monitoring (second to last para)	LZ	07/04/22	Makes reference to the specifications for additional information, but the Design Criteria forms the basis for specifications, not the other way around	09/03/22	MJW	A	Agree, reference to specification removed to avoid disrupting order of precedence. The revision directs the designers to develop for TJPA review and implement a specification for detailed information regarding the ... It is still unclear if the specifications will be prescriptive or model specs for a PDB team to revise and implement. This will have to be reconciled at final issue.				10/03/22	MJS	The responder (PMPC Team) agreed and addressed the original comment therefore it is considered closed.	10/03/22	CC
TA.004	Section 9.6.1, Groundwater Measuring Devices	LZ	07/04/22	It is titled Groundwater Measuring Devices, but also includes Ground Movement Measuring Devices. Either change the section title or create a separate sectiom	09/01/22	JL	A	Revised the title to Groundwater/Ground Movement Measuring Devices.				10/03/22	MJS	The responder (PMPC Team) agreed and addressed the original comment therefore it is considered closed.	10/03/22	CC
TA.005	Section 9.6.1, Groundwater Measuring Devices (Optical Surveys)	LZ	07/04/22	Optical Surveys is misspelled	09/01/22	JL	C	Checked the spelling of optical surveys is correct in the section.				10/03/22	MJS	The responder (PMPC Team) agreed and addressed the original comment therefore it is considered closed.	10/03/22	CC

Transbay Program
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Total Comments	**70**
Comments Closed	**70**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 10, Seismic Design*		
Document date:	*3/18/2022*		

Reviewers			
Name	Initials	Name	Initials
J. Gebelein (Design Team)	JG	E. Qi (Design Team/ATN-Structus)	EQ
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Henry Chang (Design Team/Structus)	HC	Kimo Okamitsu (Design Team)	KO
Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Fletcher Waggoner (CHSRA)	FW	Luis Zurinaga (SF CTA)	LZ
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Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
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GEC.001	Ch10 General	JG	04/08/22	In this updated DTX Design Criteria, the seismic design requirements for building structures and components are less than the minimum seismic performance requirements set forth by CalTrain and California HSR. Since CalTrain and HSR are using this station, it would seem prudent to at least meet their standards. Reference CalTrain PCJPB Standards for Design and Maintenance of Structures, Chapter 4: Seismic Design, dated August 31, 2020 and CHSRA Design Criteria Manual, Chapter 30: Seismic, notably 30.2.2 Seismic Performance Objectives, dated September 21, 2021. (The DTX appears consistent with CalTrain and HSR for underground work, this comment is for the other structures and components on the project)	05/20/22	JL/MM	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	Ch 10, General	YS	04/08/22	Should this be Chapter 13 instead of 10? If so, please make changes in the entire chapter.	05/09/22	MJS	C	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.				05/13/22	MM	The responder (PMPC Team) has made changes to the document that negate original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.003	Ch10 General	EQ	04/08/22	Please confirm that the performance objectives for each earthquake level presented in Chapter 2, Owner's requirements remain unchanged as we have not received the revised Chapter 2 yet. Should FEE earthquake level be considered in serviceability limit state such as checking crack width/control per section 11.2.2 of Chapter 11 - Structures?	05/24/22	MM	A	PMPC Team has removed duplicate information from Chapter 2 that is discussed in detail in relevant chapters (in this case, Chapter 10, Seismic Design).	05/24/22	ROK		05/24/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/24/22	CC
GEC.004	Ch 10, Page 13-2 of 12	YS	04/08/22	Update Parsons' GDR and GIR with the newer revisions.	05/09/22	MJS	A	References to the design team's GDR and GIR have been updated to latest versions.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.005	Ch10.1 Seismic Hazard	JG	04/08/22	Do the requirements to perform peer-reviewed seismic hazard assessments and directivity modeling apply to surface structures designed per the building code? This section does not indicate what items it applies to.	05/13/22	JL	A	They also apply to surface structures per building code. It was revised to clarify this accordingly.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.006	Ch10.1, Page 13-4 of 12	EQ	04/08/22	It should read "Also, the upper 30-meter (time) averaged shear wave velocity…". The word "time" should be deleted.	05/13/22	JL	A	it is "time-averaged" shear wave velocity by the definition per ASCE7 and other significant literatures, which is a frequently used term for Vs30. A hyphen will be added between time and averaged. PMPC technical editor to address as noted				05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC
GEC.007	Ch10.10 Peer Review	JG	04/08/22	Says "peer reviews must conform to the … requirements in the … CBC". There are no requirements in the CBC for peer reviews. Please clarify what the reference to the CBC is intended to mean.	05/13/22	JL	B	Section 1617.11.1 - 1.3.8 of CBC refers to Section 322 peer review requirements of the California Existing Buildings Code. We specified the section of CBC.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	Ch 10.2.1, Title, Page 13-5 of 12	YS	04/08/22	Change the section title to "Design Ground Motion Time Histories at Reference Horizon"	05/13/22	JL	A	Revised as noted	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.009	Ch 10.3.1, 1st Para., Page 13-7 of 12	YS	04/08/22	Suggest re-evaluating the requirement for not allowing load sharing in final lining design.	05/13/22	DP/JL	C	See response to comment HSR.018 in Section 13, Tunnels.							05/13/22	CC
GEC.010	Ch10.3.1, Page 13-6 of 12	EQ	04/08/22	Peer-review should be in conformance with subsection 10.10, **not 13.10**?	05/09/22	MJS	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.011	Ch10.3.1, Page 13-6 of 12	EQ	04/08/22	It should read "… ingress of flowing ground (water) …" Missing word "water".	05/09/22	MJS	A	Revised as follows: "..ingress of flowing groundwater.."	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.012	Ch10.3.3, Page 13-7 of 12	EQ	04/08/22	Typo: it should be section 10.3.1, not 13.1.1.	05/09/22	MJS	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.013	Ch10.3.3, Page 13-7 of 12	EQ	04/08/22	It is not clear if the design criteria of "displacement ductility ratio of 1.5 must be acceptable" is a demand or capacity requirement. Please clarify. Suggest to change "must" to "may be". Please confirm that under the SEE earthquake, maximum displacement ductility ratio of 1.5 is allowed.	05/13/22	NLV	A	Agreed. Changed "[...]ratio of 1.5 must be [...]" to ""[...]ratio of 1.5 may be [...]".	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.014	Ch10.3.3, Page 13-7 of 12	EQ	04/08/22	"Shear capacities of concrete structures and structural components must be designed for the strength demands…". Please clarify if shear capacities shall be designed to exceed the shear based on the expected flexural strength of the member (capacity design approach).	05/13/22	NLV	DE	Will clarify. Members should be designed to capacity protect against the shear limit state.	08/05/22	BCC	Several "DE" responses were acceptable to PMPC but may not provide the Design Team with clear direction.	09/02/22	NLV	Added sentence to specify overstrength shear be used in seismic critical members as per Caltrans SDC.	09/02/22	CC
GEC.015	Ch10.3.3, Page 13-7 of 12	EQ	04/08/22	Table 10-1 Allowable Strains. Please clarify at what compressive strain, concrete will be confined. Please confirm that the allowable strains limits are compatible with the maximum allowable displacement ductility ratio of 1.5 (under SEE event).	05/13/22	NLV	DE	Will evaluate.	08/05/22	BCC	Several "DE" responses were acceptable to PMPC but may not provide the Design Team with clear direction.	09/02/22	NLV	Table edited to match CHSRA strain limits, which will work with Caltrans SDC.	09/02/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**70**
Comments Closed	**70**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 10, Seismic Design*		
Document date:	*3/18/2022*		

Reviewers			
Name	Initials	Name	Initials
J. Gebelein (Design Team)	JG	E. Qi (Design Team/ATN-Structus)	EQ
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Henry Chang (Design Team/Structus)	HC	Kimo Okamitsu (Design Team)	KO
Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Fletcher Waggoner (CHSRA)	FW	Luis Zurinaga (SF CTA)	LZ
Responders			
Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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C – Answer provided; no action needed
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.016	Ch10.3.3, Page 13-8 of 12	EQ	04/08/22	"Expected concrete compressive strength in a seismic event". Which seismic event? SEE event?	05/13/22	NLV	C	Both events/any events considered. Clause is giving minimum f'ce to be used in design.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.017	Ch10.3.5, Page 13-8 of 12	EQ	04/08/22	Please clarify if flexible connection must be used between any two structures with drastically different stiffness/mass **(or, and)** in poor ground condition. How is it considered "drastically different"?	05/13/22	NLV	DE	Will evaluate to determine a better definition of "drastically different stiffness/mass".	08/05/22	BCC	Several "DE" responses were acceptable to PMPC but may not provide the Design Team with clear direction.	09/02/22	NLV	"Drastically different" has been defined in new equation.	09/02/22	CC
GEC.018	Ch10.4.4, Page 13-9 of 12	EQ	04/08/22	Please clarify "The factor of safety for sliding during the SEE event must be estimated but must not control the design".	05/05/22	JL	A	The sentences immediately followed clarify that permanent displacements during the SEE event must be estimated if the FS less than 1.0. We improved the clarity of the sentences.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.019	Ch10.4.4, Page 13-9 of 12	EQ	04/08/22	Please clarify "Do not consider solid bearing pressure for seismic loads for preliminary design".	05/05/22	JL	A	Revised this with clarification				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
GEC.020	Ch10.7 Buildings and Surface Facilities	JG	04/08/22	Specify what the minimum required Risk Category is for the design of surface structures. The referenced codes could be interpreted to have a much lower category than would be appropriate for the intended use and seismic performance, so it must be explicitly stated. Indicate which facilities are considered essential for operations. Conform with CalTrain/HSR requirements.	05/20/22	JL/MM	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM. Risk definitions are included in the Threat and Vulnerability Assessment and are outside of the scope of this document.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.021	Ch10.7 Buildings and Surface Facilities	JG	04/08/22	Indicate any restrictions on seismic lateral force resisting systems for essential structures. Conform with CalTrain/HSR requirements.	05/20/22	JL/MM	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.022	Ch10.7 Buildings and Surface Facilities	JG	04/08/22	Indicate the analysis requirements for seismic design of surface facilities that are supported on the below grade structure, such as station entrances. The referenced codes and standards do not clearly cover this condition, and it should not be left open to interpretation.	05/20/22	JL	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM.	08/05/22	ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.023	Ch10.8 Non-structural Components	JG	04/08/22	Section 10.7 says conform to the CBC and ASCE 7-22; but 10.8 says only the CBC which the current edition uses ASCE 7-16. Please clarify if we are using two different versions of ASCE 7, or if 10.8 should also use ASCE 7-22	05/24/22	MM	A	Revised as noted	05/24/22	ROK		05/24/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/24/22	CC
GEC.024	Chapter 13	PC	09/12/16	LEGACY Comment GEC16.081 - OBE design event?	05/20/22	JL	A	AASHTO LRFD Tunnels will now govern the design earthquake types: Safety evaluation earthquake (SEE) and functionality evaluation earthquake (FEE) will be defined in Rev Book 02	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.025	Chapter 13	PC	09/12/16	LEGACY Comment GEC16.082 - Should we list the ground motion time histories be used for design in this , or you prefer to keep those in geotechnical documents.	05/20/22	AK	C	It is preferred to reference the geotechnical documents as to not duplicate information across more than one document.		ROK					05/04/22	CC
GEC.026	Page 13-1 of 10	HC	09/12/16	LEGACY Comment GEC16.083 - Under the sub-heading of OBE: Please provide Criteria for OBE.	05/20/22	AK	C	The performance objectives for OBE are in Section 2.6 of the Design Criteria Manual.		ROK					05/04/22	CC
GEC.027	Page 13-1 of 10	HC	09/12/16	LEGACY Comment GEC16.084 - Under the sub-heading of Codes, Standards and Guidelines: Please confirm if latest codes and standards should be used instead of older versions. For example, the latest version of Caltrans Memo to Designers 20-1 is 2010 instead of 1999 listed. Uniform Building Code 1997 is referenced but not used by practitioners nowadays.	05/20/22	AK	A	Will check specific criteria listed to confirm most current information is being used. Will remove reference to UBC code.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.028	Page 13-2 of 10	HC	09/12/16	LEGACY Comment GEC16.085 - Under the sub-heading of "References": Please clarify if the latest version of BART Facilities Standards, BFS 3.03 (2016) should be referenced instead of the 2004 version.	05/20/22	AK	A	Will check specific criteria listed to confirm most current information is being used.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.029	Section 13.4.4 Page 13-8 of 10	HC	09/12/16	LEGACY Comment GEC16.086 - Under the sub-heading of 13.4.4, "Overturning": Please clarify if there is a factor of safety for OBE and for MDE.	05/20/22	NLV	B	B/6 is the maximum eccentricity allowed per AREMA.		PAR	Please clarify if the overturning check will be performed for both OBE and MDE? If so, what is the Safety Factor is for each load combination involved OBE and MDE?	05/13/22	JL	Clarified - The maximum eccentricity was specified for overturning check.	05/13/22	CC
GEC.030	Sect. 13	YS		LEGACY Comment GEC18.088 - Based on MJA's experiences from other projects which potentially affect existing structures such as a highway superstructures, the owner such as Caltrans of the existing structures could require the evaluation of impact of their seismic design earthquake used for those structures. For example, should Caltrans have used a return period of 2500 yr. for their superstructure design, DTX might have to consider that return period for the tunnel section which could be considered to have an impact. So special circumstances might exist.	05/20/22	NLV/MJS	A	Need to discuss with TJPA. (MJS) Slate geotechnical is developing a ground motions study to determine project wide applicable design return period. Special cases will need to be reviewed and approved by the TJPA.		PAR	Will review the final decision from TJPA on this issue.	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 70
Comments Closed 70
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 10, Seismic Design*		
Document date:	*3/18/2022*		

Reviewers			
Name	Initials	Name	Initials
J. Gebelein (Design Team)	JG	E. Qi (Design Team/ATN-Structus)	EQ
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Henry Chang (Design Team/Structus)	HC	Kimo Okamitsu (Design Team)	KO
Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Fletcher Waggoner (CHSRA)	FW	Luis Zurinaga (SF CTA)	LZ
Responders			
Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.031	Sect. 13	YShi		LEGACY Comment GEC18.089 - Provide OBE criteria (currently noted as "Criteria in abeyance").	05/20/22	AK	C	Same as comment GEC16.083.	05/13/22	ROK	No further comment.				05/04/22	CC
GEC.032	Sect. 13	KO		LEGACY Comment GEC18.090 - Recommend revising ODE and MDE criteria as follows (consistent with Westside): ODE: A return period of 150 years (50% probability of exceedance in 100 years) is used to establish the ODE. MDE: A return period of 2500 years (4% probability of exceedance in 100 years) is used to establish the MDE.	05/20/22	JL	C	A return period of 975 years is used for Safety Evaluation Earthquake (SEE) or MDE, which is consistent with similar high-profile projects in the Bay Area including Central Subway, CHSRA, and Caltrans' SDC.	05/04/22	ROK					05/04/22	CC
GEC.033	Sect. 13.1	YS		LEGACY Comment GEC18.091 - Site classes along the alignment should be updated to reflect the proposed changes in the alignment and excavation methods.	05/20/22	AK	A	Site classes are currently referencing the National Earthquake Hazards Reduction Program (NEHRP) site classifications. The site class categories will be modified based on changes to the alignment and excavation methods as applicable.	05/13/22	ROK	No further comment.	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.034	DC 13.1	PC		LEGACY Comment GEC18.092 - We need to update these sections. I assume the site classes may stay the same, but the descriptions will change.	05/20/22	AK	A	Will be updated. Similar to comment GEC18.092.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.035	DC 13.2	PC		LEGACY Comment GEC18.093 - The reference to Arup will be revised.	05/20/22	AK	A	Revised as noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.036	Sect. 13.3, 1st sentence	YS		LEGACY Comment GEC18.094 - Change "static" to "dynamic".	05/20/22	AG	A	Revised as noted.	05/13/22	ROK	No further comment.	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.037	Sect. 13.3.1, 3rd paragraph	YS		LEGACY Comment GEC18.095 - The seismic design and analysis techniques should also include those developed by Hashash et al.	05/20/22	AG	A	Added.	05/13/22	ROK	No further comment.	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.038	13.3.2	DMJ		LEGACY Comment GEC18.096 - If conventional strength design is performed including force effects caused by MDE racking displacement (with slabs at Ig and walls at 0.5Ig), including Modified Compression Field Theory design for shear over-strength design for shear is not required	05/20/22	NLV	B	If cross section elements remain elastic when racking displacements of considered earthquake event are applied, overstrength design for shear is not required.	05/13/22	ROK	Response Okay				05/04/22	CC
GEC.039	13.1	AK		LEGACY Comment PMPC.003 - Is using Zone maps from UBC an outdated practice? Need input and guidance from SME to revise this section.	05/20/22	JL	A	UBC Zone was removed.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.040	10.8 Non-Structural Components	JG	08/05/22	The last sentence of paragraph two in certain cases dictates a design that is less than the building code. Please change "Non-essential equipment and equipment supports, and anchorage must be designed using an importance factor of 1.0." to instead read "Non-essential equipment and equipment supports, and anchorage ~~must~~ may be designed using an importance factor of 1.0 where permitted by the refereneed codes."	08/18/22	JL	A	Addressed				09/02/22	NLV	Sentence edited in similar verbiage as suggested edit.	09/02/22	CC
Cal.001	Chapter 10	BZ	04/21/22	reconcile chapter number with section 1.6 Design Criteria Organization; renumber chapter subsection accordingly	05/09/22	MJS	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.002	Chapter 10 - 10.3.1	BZ	04/21/22	check slab structure for cracked condition; 0.5Ig	05/16/22	JL	A/DE	revised as follows. "In the soil-structure analysis, the gross moment of inertia (Ig) must be used if uncracked slabs/walls are considered, and an appropriate fraction of the gross moment of inertia (e.g., 0.5 Ig) must be used if cracked slabs/walls are considered."				05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC
Cal.003	Chapter 10 - 10.3.1	BZ	04/21/22	Proposed joint locations and magnitude of joint opening must be approved by the TJPA and PCJPB.	05/16/22	MM	DE	The governance and approval process between TJPA and PCJPB is being coordinated via the Master Cooperative Agreement. The output of that agreement can be incorporated into the next update of the design criteria.				05/16/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.004	Chapter 10 - 10.1.1	BZ	04/21/22	revise section number	05/09/22	MJS	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.005	Chapter 10 - 10.4	BZ	04/21/22	omit 'generally'	05/09/22	MJS	A	Revised as noted.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.006	Chapter 10 - 10.4	BZ	04/21/22	include; and AREMA Chapter 8.	05/13/22	JL	DE	will consider including AREMA Ch.8 in the next revision.				05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC
Cal.007	Chapter 10 - 10.9.2	BZ	04/21/22	revise to 'project geotechnical engineer of record'; revise all references to geotechnical engineer accordingly	05/13/22	MM	B	TJPA requires staff to hold a California registrations, 'the California-registered geotechnical engineer' intentionally.				05/13/22	MM	The responder (PMPC Team) will has confirmed that the criteria is compliant with TJPA requirements; therefore this comment is considered closed.	05/13/22	CC
Cal.008	Chapter 10 - 10.9.3	BZ	04/21/22	Slope reinforcement must be approved by the TJPA and PCJPB.	05/16/22	MM	DE	See response to Cal.003.				05/16/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.009	Chapter 10 - 10.10	BZ	04/21/22	revise to 'be approved by the TJPA and PCJPB'	05/16/22	MM	DE	See response to Cal.003.				05/16/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.010	Section 13.6	BZ	10/18/18	LEGACY Comment Cal18.039 - Section 13.6 Bridges (highlighted text - "Caltrans Seismic Design Criteria." For railway bridges, seismic design shall be in accordance with AREMA Chapter 9.	05/20/22	MJS/JL	A	Caltrans Seismic Design Criteria has been included in the "References" section of the chapter. AASHTO LRFD Tunnels will govern seismic design.	05/13/22	ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
Cal.011	Chapter 10 Section 10.3.1; (Page 10-7 of 13)	JP	07/12/22	Load sharing between the temporary construction support and the final lining of the mined tunnel shall be justified by analysis and approved by TJPA prior to NTP for final design. (reference MINED Tunnel Design Preliminary Engineering Technical Memorandum 334.1.1)	08/18/22	DP/JL	C	See Chapter 13, Tunnel comment review log - response to comment Cal.015 and similar comment responses referenced within that response - GEC.010, as well as responses to HSR.018 and HSR.029.				10/03/22	MJS	The responder (PMPC Team) provided references within this CRL that satisfactorilly resolve the inquiry; comment is considered closed.	10/03/22	CC
Cal.012	Chapter 10 Section 10.7; (Page 10-11 of 13)	JP	07/12/22	include San Francisco Building Code	08/18/22	JL	A	Editorial – PMPC Team will update accordingly. (Added text. Did you want the exact code listed? It is not - SL)				09/02/22	NLV	Agree. SFBC added to sentence.	10/03/22	CC

Transbay Program
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Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 10, Seismic Design*		
Document date:	*3/18/2022*		

Reviewers			
Name	Initials	Name	Initials
J. Gebelein (Design Team)	JG	E. Qi (Design Team/ATN-Structus)	EQ
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Henry Chang (Design Team/Structus)	HC	Kimo Okamitsu (Design Team)	KO
Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Fletcher Waggoner (CHSRA)	FW	Luis Zurinaga (SF CTA)	LZ
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Jongwon Lee (PMPC SME/Mott MacDonald)	JL	Martin J. Walker (PMPC SME/Mott MacDonald)	MJW
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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HSR.001	Chapter 10 - Scope	FW	04/06/22	Apparently this Chapter used to be 13, but now 10. Section 13.1.1: Structural Component Design needs renumbering. This section states "The performance objectives for each earthquake level are presented in Chapter 2, Owner's Requirements." Since Chapter 2 not available to me, I can't review relative to the criteria in this chapter.	05/03/22	JL	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.	06/23/22	ROK	Ok	05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.002	Chapter 10 - Scope	FW	04/06/22	The lower level probabilistic EQ varies in CHSR Criteria where the Operational Basis Earthquake (OBE) has 50-year return period vs. the FEE of 475-year for DTX.	05/19/22	MM	C	DTX vs. CHSRA: •MDE/MCE: The ground motions for DTX and CHSRA are similar, with return periods of approximately 1,000 years. However, the performance criteria for DTX is more stringent than that of CHSRA. •OBE: The ground motions for DTX are higher than that of CHSRA, while the structural performance criteria is relatively the same between the two. In general, the seismic criteria for DTX is more stringent than that of CHSRA. This can be attributed to a few reasons: •DTX only has underground tunnels/structures, which typically perform better than elevated structures (bridges). Therefore, designing tunnels for a higher seismic performance does not come at the same high cost premium as it does for elevated structures. •For the OBE, the ground motions for CHSRA are much lower than DTX. This is because the tolerances required by CHSRA to run trains in excess of 200 mph are extremely tight, and designing for these tolerances using a large seismic event is impractical. In contrast, the DTX speeds are much lower (40 mph max) and so the higher ground motions don't significantly impact the overall performance. It should be noted that most tunnels and underground structures are neither easily inspectable nor accessible (especially exterior faces and corners). The underground structures are designed "elastically" under OBE. However, in high seismic areas the reinforcement is typically increased to limit ductility/strain damage on the exterior faces. Therefore, as long as OBE doesn't specify too high of a ground motion, the MDE will generally govern the reinforcement design. If the structure is damaged under the MDE, the difficulty of repairing the structure may not allow train service to return in a reasonable time frame. Therefore, the structure performance and repairability under the MDE is typically checked very closely by the designers. Based on our design team's past seismic design experience for Underground	06/23/22	ROK	Ok				05/19/22	CC
HSR.003	10.2.2 - Site Response Analysis	FW	04/06/22	This section states "site response analysis must be performed using both equivalent linear and nonlinear techniques". However, it doesn't state which one should be used for the analysis time histories. Do both need be considered in the ground motion application ? This would double the amount of time histories from 11 to 22. How to determine if the equivalent linear or nonlinear results should be used ?	05/05/22	JL	B	As specified in the DCM, both approaches must be performed and an adequate approach will be selected. The same suite of input ground motions will be used in both approaches, and only the results from the adequate approach will be used in design. There are literatures for evaluating the approaches to determine which one is appropriate. This item must be peer reviewed in accordance with the DCM.	06/23/22	ROK	Ok, peer review to determine if linear or nonlinear motions to apply.	05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC
HSR.004	10.3.1 - Analysis	FW	04/06/22	Within the second bullet, it states "In the soil-structure analysis, the gross moment of inertia (Ig) must be used for slabs and an appropriate fraction of the gross moment of inertia (e.g., 0.5 Ig) must be used for walls." This appears to be relative to racking analyses (either pseudo-static of dynamic SSI). For the SEE, how does this approach allow cut/cover strain prediction relative to the post-yield inelastic 0.006 concrete/0.02 steel strain limits in Table 10-1? Isn't a non-linear representation (i.e.: moment-curvature, fiber element) representation of the wall needed ?	05/20/22	JL	C/DE	The moment of inertia will be affected by non-linear response, which is likely in walls under design earthquakes. This sentence provides the specification in modelling structures in dynamic SSI in terms of Ig that depends on whether cracking is expected - i.e., cracked walls will have a lower Ig. With the specified modelling condition, the allowable strains in Table 10-1 must be met. This sentence was revised as follows. "In the soil-structure analysis, the gross moment of inertia (Ig) must be used if uncracked slabs/walls are considered, and an appropriate fraction of the gross moment of inertia (e.g., 0.5 Ig) must be used if cracked slabs/walls are considered."	06/23/22	BCC	Disagree, if model is linear, elastic, then how can you predict inelastic strains ? Do you plan to use "equal-displacement" methodology (effective properties for demands, non-linear properties for push-over/racking capacities ? Otherwise, per original comment, recommend non-linear modeling to determine strains.	08/26/22	JL	Our intent was to require the consideration of reduction in moment of inertia for cracked sections if elastic analysis is performed, not to encourage a simplified approach rather than non-linear analysis. Agreed with reviewer's comment and revised the relevant sentences accordingly as follows. In the soil-structure analysis, elastic models are acceptable if the structural response remains elastic. In elastic analysis, an appropriate fraction of the gross moment of inertia (e.g., 0.5 Ig) must be used if cracked slabs/walls are considered while the gross moment of inertia (Ig) must be used if uncracked slabs/walls are considered. If the structural response is into inelastic range, non-linear analysis must be performed and the resulting strains must be evaluated. CRM with CHSRA held on 5/10 where agreement was reached, comment is considered resolved.	10/05/22	CC
HSR.005	10.3.1 - Analysis	FW	04/06/22	The section states "In addition to maintaining structural capacity, the structure must also maintain its barrier to ingress of flowing ground and protection against inundation by groundwater or other water from ruptured utility lines, or the like, in the event of a rupture of the lining and waterproofing system." This statement needs clarification. If the lining & waterproofing system both rupture, then how can the structure be protected against groundwater inundation ? Are you suggesting a redundant secondary waterproofing system ?	05/20/22	JL	A	Revised to read as follows: "In addition to maintaining structural capacity, the underground structure must also maintain its barrier to the ingress of flowing groundwater as a result of FEE and SEE events."	06/23/22	ROK	Agree	05/20/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/20/22	CC

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 10, Seismic Design*		
Document date:	*3/18/2022*		

Reviewers			
Name	Initials	Name	Initials
J. Gebelein (Design Team)	JG	E. Qi (Design Team/ATN-Structus)	EQ
Y. Sun (Design Team/MJA)	YS	Peter Chou (Design Team)	PC
Henry Chang (Design Team/Structus)	HC	Kimo Okamitsu (Design Team)	KO
Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Fletcher Waggoner (CHSRA)	FW	Luis Zurinaga (SF CTA)	LZ
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HSR.006	10.3.1 - Analysis	FW	04/06/22	The section states "If joints are proposed within the mined tunnel final lining, the designer must verify the magnitude of joint openings and ensure that adequate joint compression is maintained during seismic events." CHSR criteria is similar and approaches this as the segments are capacity protected by the joints, such that plastic hinges do not form within the segment. The following are required: •No net tension across the joint shall occur. •Joint shear capacity shall be evaluated and compared to shear demands. •Joint bearing and compressive capacity against its bearing surface shall be evaluated and compared to applicable demands.	05/20/22	JL	DE	will consider further clarification in the next revision.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	09/13/22	JL/DP	Agreed. those specifications were added.	09/13/22	CC
HSR.007	10.3.2 - Seismic Load Combinations	FW	04/06/22	Extreme Event T-I, EQ = 1.0 Will this apply to both the FEE & SEE ? In CHSR, the lower level (OBE) event is a separate Strength load case, refer to CHSR.	05/13/22	NLV	A	Re: Extreme T-1, EQ = 1.0. That is the intent. Re: Load Cases. Will evaluate when evaluating Transient Loads listed in Comment HSR.004 for Structures Chapter.	06/23/22	ROK	Ok, but recommend specifying separate load combinations for FEE & SEE (i..e.: Exterme Event T-1a for FEE, T-1b for SEE, or similar)	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
HSR.008	"10.3.3" - Structural Component Design	FW	04/06/22	For each tunnel type, what ductile structure components are allowed to undergo inelastic deformation in a design earthquake? Similar to CHSR criteria for rectangular box-type structures, it seems you are intending for the walls to be the targeted region for inelastic deformation (plastic hinges), with the adjacent roof/invert slabs capacity protected & subject to 120% over-strength.	05/20/22	JL	DE	will consider further clarification in the next revision.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	08/31/22	JL/NLV	We do not specify what ductile structure components are allowed to have an inelastic response subject to a design earthquake, but require them to be designed properly also considering the displacement capacity of the structure incorporating its ductile non-linear response. The following sentence was added accordingly. Proper detailing at the ductile components must be provided to support overall seismic design through evaluating the displacement capacity of the structure, capturing its ductile non-linear response. CRM with CHSRA held on 10/5/22 - Reached agreement on response for this phase of design after (appears consistent with LA Metro design criteria).	10/05/22	CC
HSR.009	"10.3.3" - Structural Component Design	FW	04/06/22	Third paragraph states "a displacement ductility ratio of 1.5 must be acceptable as the criteria for operability performance". This is inconsistent with Table 10-1 for FEE (operability) strain limits which, for cut-cover, are 0.003 concrete/0.002 steel. 0.003 concrete strain (cover) is typical limit for strength design & 0.002 is basically yield for grade 60 steel, with expected yield stress of 68 ksi per CSDC (68/29000 = 0.0023). Recommend revising displacement ductility closer to 1.0.	05/24/22	NLV	DE	Designers to evaluate. Direction of next revision would be to refer to Caltrans SDC.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	09/02/22	NLV	Displacement ductility limit corrected to 1.0.	09/02/22	CC
HSR.010	"10.3.3" - Structural Component Design	FW	04/06/22	Fourth paragraph states: "The shear capacities of concrete structures and structural components must be designed for the strength demands, including strength demands based on seismic load combinations. Effective section properties of the walls must be used to evaluate demands associated with seismic racking. All components are essentially elastic." Similar to CHSR criteria for rectangular box-type structure, recommend revisions: 1. Shear capacity of targeted inelastic walls > the plastic shear (Vp = 2Mp/ht) of the walls, using specified minimum f'c & phi = 1.0 2. To assess SEE strain demands in the walls, a nonlinear representation (i.e.: moment-curvature, fiber elements) should be used. 3. Omit "All components are essentially elastic", this doesn't make sense with respect to the allowable SEE strain limits in Table 10-1.	05/20/22	JL	DE	Will consider further clarification in the next revision.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	08/31/22	JL/NLV	Agreed. The sentence, 'All components are essentially elastic', was removed and the following sentence was added. Structures designed for an inelastic behavior in a design earthquake (SEE) must be modeled by appropriate methods accounting for material, component, and geometric nonlinearities. CRM with CHSRA held on 10/5/22 - Reached agreement on response for this phase of design (appears consistent with LA Metro design criteria).	10/05/22	CC
HSR.011	10.3.3 - Material Properties and Allowable Strains	FW	04/06/22	Within Table 10-1, it is assumed that the concrete compressive strain limits are relative to the cover concrete. Note that CHSR has strain limits relative to cover (unconfined) and core (confined) regions, as appropriate. Note that the CHSR reinforcement strain limits are substantially larger than Table 10-1 for both the FEE (or OBE in CHSR), and SEE (or MCE in CHSR). CHSR strain limits are also bar size dependent (i.e.: #10 bar & smaller, #11 bar & larger), consistent with CSDC. Note that the Table 10-1 SEE cut-cover concrete compressive strain of 0.006 exceeds the "spalling strain" of 0.005 within CSDC. Recommend providing SSE concrete limits relative to the core (confined) region, not a cover concrete strain exceeding spalling.	05/24/22	NLV	DE	Designers to evaluate. Direction of next revision would be to refer to Caltrans SDC.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	09/02/22	NLV	Table edited to match CHSRA strain limits.		CC
HSR.012	10.3.4 - Material Properties and Allowable Strains	FW	04/06/22	End of the section states: "The expected concrete compressive strength in a seismic event (f'ce) must be equal to the greater of 5,000 psi or 1.3 times the specified compressive strength (f'c)." This is identical to CSDC, so covered by the last sentence "Caltrans SDC provides values and formulations for expected material properties."	05/05/22	JL	A	Removed first sentence and revised final sentence for reference.	06/23/22	ROK	agree.	05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.013	10.4.2 & 3 - Seismic Loading on Retaining Structures	FW	04/06/22	Refer to CHSR criteria (DCM 32) for a similar, but more extensive break-out of seismic loading for various retaining structures.	05/20/22	JL	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM.	06/23/22	ROK	Agree, understood about SFDBI compliance. I was only pointing out CHSR's more detailed seismic loading for retaining structures.	05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC

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Yue Shi (Design Team)	YShi	David Jones (Design Team)	DMJ
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
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HSR.014	10.4.4 - Factors of Safety for Earth Retaining Structures under Seismic Loading	FW	04/06/22	Instead of a "factor of safety" approach, CHSR criteria (DCM 32) uses the Strength & Extreme limit states with factored resistance for sliding/bearing, and a less conservative eccentricity limit (than B/6) for seismic load case overturning.	05/20/22	JL	B	Buildings and surface facilities need to be designed in accordance with the SFBC that refers to CBC and ASCE7. The design will be reviewed by SFDBI for permits. SFDBI will make sure the design be fully compliant with the prescriptive provisions of the SFBC and the guidelines in their Administrative Bulletins (AB; https://sfdbi.org/administrative-bulletins). Hence, we need to ensure that design of buildings and surface facilities meets SFBC – i.e., CBC and ASCE7 as specified in the current DCM.	06/23/22	ROK	Agree, understood about SFDBI compliance. I was only pointing out CHSR's use of LRFD design (not factor of safety approach) for retaining structures.	05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC
HSR.015	10.4.4 - Factors of Safety for Earth Retaining Structures under Seismic Loading	FW	04/06/22	Clarify if B/6 eccentricity limit applies for both FEE or SEE.	05/24/22	NLV	A	Limits have been redefined for FEE and SEE.	06/23/22	ROK	Agree, revision confirmed.	05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
HSR.016	10.4.4 - Factors of Safety for Earth Retaining Structures under Seismic Loading	FW	04/06/22	This section states: "Bearing Pressure. Do not consider soil bearing pressure for seismic loads for preliminary design." What is purpose of including this statement in design criteria? Instead, recommend defining what is required for final design.	05/20/22	JL	A	revised this with clarification	06/23/22	ROK	Agree, revision confirmed.	05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.017	10 (first section)	EA	06/23/22	"The performance objectives for each earthquake level are presented in Chapter 2, Owner's Requirements" That information is not in Chapter 2, or anywhere else in the document.	08/18/22	JL	A	Deleted sentence referencing Chapter 2				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC
TA.001	Section 10.10, Peer Review (second para)	LZ	07/04/22	Add "be" between "must" and "approved" in 2nd para	08/18/22	JL	A	Editorial – revised as noted				10/03/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/03/22	CC

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 11, Protection of Existing Infrastructure*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Sangyoon Min (Design Team)	SM	Fletcher Waggoner (CHSRA)	FW
Michael Bowers (CHSRA)	MB	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Martin J. Walker (PMPC SME/Mott MacDonald)	MJW	Derek Penrice (PMPC SME/Mott MacDonald)	DP

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OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Chapter 11 - Protection of Existing Infrastructure	SM	03/16/22	See tracked changes and review comments in "Chapter 10_Protection of Existing Infrastructure_SM.docx"	04/25/22	MJS	C	Comments from .docx file have been incorporated in this spreadsheet, see comments # GEC.001-008				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	Chapter 11 Revision Record Table, Fifth line	SM	03/15/22	Figure 11.3 may need to be removed to avoid any confusion due to two different definitions of zone of influence. See comments in Section 11.1.1.	05/20/22	MM	A	Figures removed from chapters				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	11.1 - Ground Movements/Settlement Estimates	SM	03/15/22	This section needs more clarification about when to use numerical method and when to use empirical method. To be consistent with the standard practice and previous building damage assessment, this section should discuss different stages of damage assessment of the buildings: For example, Stage 1 is a preliminary damage assessment phase. In this stage, the buildings potentially subject to settlement within the zone of influence are identified. These are taken forward to Stage 2, where more detailed screening of the potential settlement and building assessment are carried out using the empirical methods. For buildings with higher building damage categories exceeding threshold screening criteria in Stage 2, Stage 3 assessment is performed using a finite element numerical modeling. If unacceptable movements and potential building damages are predicted, and depending on the nature of the movements and the structure affected, building protection and mitigation measures will be developed.	05/04/22	MJW	C	The Boscarding and Cording method is mentioned in Section 10.1. Buildings that will require SSI should be evaluated by the designer on a case-by-case basis. Designer will assume some level of risk. Property protection sections have been updated accordingly.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	11.2 - Assessment of Ground and Structure Movements, ¶3-2	SM	03/15/22	This is different from the definition of ZOI included in the previous design criteria which was used in the previous damage assessment report by Arup in 2010, and Parsons in 2017 following instruction by TJPA. According to email from Matt on March 11, the ZOI will be modified to ¼" "I recommend at this point revising to ¼ inch in the criteria, deleting the image (duplicate/extraneous), and shelving the criterion section until the procurement method is clear. The TJPA should be on record that it does not expect Parsons to redo the PPS to conform to the new criteria. The DB contractor will have to update it and take ownership of it when the time comes." The image included in previously version needs to be included to clarify the ZOI for different construction method (cut and cover and mined tunnel) with the new ZOI (1/4").	05/25/22	MJW	A	Revised to ¼ inch in the criteria, deleted the images, and shelved the criterion section until the procurement method is clear. The TJPA should be on record that it does not expect Parsons to redo the PPS to conform to the new criteria. The DB contractor will have to update it and take ownership of it when the time comes.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	11.2 - Assessment of Ground and Structure Movements, ¶4-1	SM	03/15/22	Regarding "Determination of the 1/8-inch ground movement" - see comment above (comment #4) on ZOI.	05/25/22	MJW	A	See response to comment #GEC.004				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	10.2 - Assessment of Ground and Structure Movements, ¶8-1	SM	03/15/22	Two different definitions of ZOI are used. Figures 10-1 and 10-2 may need to be removed to avoid confliction with the definition of ZOI in 10-3 (1/4"). Figure 10-1 and Figure 10-2 are also different from many references that are used for Chapter 10. Those two figures can be used for the first screening purposes, but determination of using underpinning should be based on the detailed analysis anyway. The purpose of the ZOI is to determine buildings to be assessed.	05/04/22	MJW	A	Figures removed from chapters				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	11.2 - Assessment of Ground and Structure Movements, ¶9-1	SM	03/15/22	The SSI analysis may not be required for all structures within the ZOI. This section shall discuss the building damage category (e.g., by Cording etc.) or building vulnerability level with which the structures can be categorized depending on structural stability of structures. It needs to define clearly in which buildings or/and circumstances the designer shall perform SSI interaction (for example, if the damage category of structures are greater than certain level, SSI analysis shall be performed).	05/04/22	MJW	C	The Boscarding and Cording method is mentioned in Section 10.1. Buildings that will require SSI should be evaluated by the designer on a case-by-case basis. Designer will assume some level of risk. Property protection sections have been updated accordingly.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	11.2.1 - Tunnel, Figure 11-3: Evaluation of damage risk for pile-supported structures	SM	03/15/22	Can this figure be appliable to mined tunnel as well? The definition of ZOI is different, and what are the differences between 10-2 and 10-3?	05/25/22	MJW	A	Figures removed from chapters				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	Sect. 10.1	YS		LEGACY Comment GEC18.045 - Requirements discussed in this section and Figures 10.1 and 10.2 do not cover any scenarios where the excavations occurring adjacent to or above an existing underground structures or tunnels which are located in Zone C. Will the DTX alignment exclude these scenarios? Also, pile(s) of the adjacent highway super-structures may be founded in Zone C but influenced by the ground movements induced by underground excavations. This scenario is not captured in these figures.	05/04/22	MJW	A	Pile information has been defined and information applicable to protection of adjacent structures has been clarified.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.010	Section 10.2	SM		LEGACY Comment GEC18.046 - It says " the designer shall perform soil-structure interaction analyses to demonstrate–" The SSI analysis may not be required for all structures within the ZOI. It needs to define clearly in which buildings or/and circumstances the designer shall perform SSI interaction (for example, if the damage category of structures are greater than certain level, SSI analysis shall be performed).	05/04/22	MJW	C	The Boscardin and Cording method is mentioned in Section 10.1. Buildings that will require SSI should be evaluated by the designer on a case-by-case basis. Designer will assume some level of risk.		PAR	This needs to be more specific. For example, no additional analyses are required for buildings with damage categories of "Negligible" and "Very Slight" since these levels of building damage are considered to be cosmetic and insignificant (Burland et al., 1977, and Cording & Boscardin, 1989). However, additional numerical analyses are required for buildings with damage categories of "Slight" or greater.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	Section 10.2	SM		LEGACY Comment GEC18.047 - As per the email from Meghan Murphy in September 9, 2016, the ZOI shall be revised to reflect Arup's approach to the zone of influence (Method 2 in the attachment). Please see attachment. Figures 10.1 and Figures 10.2 shall be replaced with those shown on the attachment with description of the new zone of influence.	05/04/22	AK	A	The previous Figures 10.1 and 10.2 were deleted and the latest zone of influence graphic from Parsons for "Method 2," dated 9/7/16, has been placed in the Design Criteria.		PAR	According to email from Matt on March 11, the ZOI will be modified to ¼" "I recommend at this point revising to ¼ inch in the criteria, deleting the image (duplicate/extraneous), and shelving the criterion section until the procurement method is clear. The TJPA should be on record that it does not expect Parsons to redo the PPS to conform to the new criteria. The DB contractor will have to update it and take ownership of it when the time comes."	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.012	Section 10.2	KA		LEGACY Comment GEC18.048 - Zone of influence diagram. Underpinning has a specific meaning and impacts on existing buildings are influenced by soil type and shoring method. Suggest removing this table as it is misleading.	05/04/22	AK	A	Table has been removed.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.013	10.3 Ground water	KA		LEGACY Comment GEC18.049 - This requirement to avoid where possible can be very restrictive and is in conflict with 9.4. Suggest reference 9.4 here	05/04/22	MJW	A	Groundwater sections have been revised and will be developed in concert with SEIR compliance.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**50**
Comments Closed	**50**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 11, Protection of Existing Infrastructure*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Sangyoon Min (Design Team)	SM	Fletcher Waggoner (CHSRA)	FW
Michael Bowers (CHSRA)	MB	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Martin J. Walker (PMPC SME/Mott MacDonald)	MJW	Derek Penrice (PMPC SME/Mott MacDonald)	DP

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.014	10.3 zone of influence	KA		LEGACY Comment GEC18.050 - We are providing settlement troughs which make the footnotes of this table redundant. Suggest removing footnotes	05/04/22	AK	A	Footnotes have been removed.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/13/22	CC
GEC.015	Section 10.2	SM	09/12/16	LEGACY Comment GEC16.051 - It says " the designer shall perform soil-structure interaction analyses to demonstrate–" The SSI analysis may not be required for all structures within the ZOI. This section shall discuss the building damage category (e.g., by Boscarding and Cording etc.) or building vulnerability level with which the structures can be categorized depending on structural stability of structures. It needs to define clearly in which buildings or/and circumstances the designer shall perform SSI interaction (for example, if the damage category of structures are greater than certain level, SSI analysis shall be performed).	05/04/22	MJW	C	The Boscarding and Cording method is mentioned in Section 10.1. Buildings that will require SSI should be evaluated by the designer on a case-by-case basis. Designer will assume some level of risk. Property protection sections have been updated accordingly.		PAR	This needs to be more specific. For example, no additional analyses are required for buildings with damage categories of "Negligible" and "Very Slight" since these levels of building damage are considered to be cosmetic and insignificant (Burland et al., 1977, and Cording & Boscardin, 1989). However, additional numerical analyses are required for buildings with damage categories of "Slight" or greater.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.016	Section 10.2 & 10.3, (Figures 10.1 and 10.2)	SM	09/12/16	LEGACY Comment GEC16.052 - There's still possibility that buildings outside zone of influence defined in Figures 10.1 and 10.2 can be affected by construction activities and need to be analyzed. Therefore, the zone of influence should be defined and determined by the allowable settlement or other conservative approach rather than simply by D:H ratio (e.g., 1:1, 1:2) as shown in Figures 10.1 and 10.2.	05/04/22	AK	A	Zone of influence diagram has been updated for various scenarios.		PAR	Two different definitions of ZOI are used. Figures 10.1, 10.2 and 10.3 need to be removed to avoid any unnecessary confusion. SME has decided to change the ZOI to 1/4".	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.017	Section 10.2 (Figure)	PC	09/12/16	LEGACY Comment GEC16.053 - Internal discussion (TJPA and Design Team): We need to make sure Fig 10.1 is in general agreement with zone of influence lines for building impact analyses that TJPA wants Parsons to take.	05/04/22	AK	A	Updated Zone of Influence diagrams have been inserted into Design Criteria as Figure 10.1. Refer to email dated 9/28/18 from Meghan Murphy titled, "Central Artery experience in future building development of TOD," for additional information.		PAR	Please refer to email responses from Matt Schreffler and Martin Walker. The definition of ZOI has been revised to 1/4" and all figures recommended to be removed.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.018	Section 10.3 (Figure)	PC	09/12/16	LEGACY Comment GEC16.054 - Internal discussion (TJPA and Design Team): We need to make sure Fig 10.2 is in general agreement with zone of influence lines for building impact analyses that TJPA wants Parsons to take.	05/04/22	AK	C	Previous Figure 10.2 has been deleted from the Design Criteria.		PAR	Please refer to email responses from Matt Schreffler and Martin Walker. The definition of ZOI has been revised to 1/4" and all figures recommended to be removed.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.019	Section 10.4	PC	09/12/16	LEGACY Comment GEC16.055 - Is there a specific threshold design table that TJPA want to follow? We should clearly refer to the table as design criteria at the end.	05/04/22	AK	A	Updated Zone of Influence diagrams have been inserted into Design Criteria as Figure 10.1. Refer to email dated 9/28/18 from Meghan Murphy titled, "Central Artery experience in future building development of TOD," for additional information.		PAR	Please refer to email responses from Matt Schreffler and Martin Walker. The definition of ZOI has been revised to 1/4" and all figures recommended to be removed.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.001	Chapter 11 - Scope	FW	03/28/22	"This chapter seems to focus on existing structure protection during construction ""resulting from excavation associated with the construction"". Should the scope also address the post-construction seismic resistance/response (i.e.: no added harm due to the new construction) of the existing structures ? Section 10.2 discusses additional loads imposed upon existing foundations with respect to excavation related ground movements, and mitigations (underpinning, protective works), but not post-construction existing structure seismic response. Is the assumption that the post-construction existing structure seismic resistance/response the same as the current pre-construction state ?"	05/25/22	MJS/DP	B	No, the suggested scope to address post-construction seismic resistance/response of existing structures is not considered within the scope of the DTX Design Criteria.	06/23/22	BCC	Understood, not within scope of DTX Design Criteria. However, to avoid future disputes, recommend TJPA consider existing structure be subject to "no added harm due to new construction" per the original comment.	10/06/22	MJW	The commentor (CHSRA) agreed that the topic is not within the scope of the DTX Design Criteria. The responder (PMPC Team) has agreed to investigate the proposed clause during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/06/22	CC
HSR.002	11.1.1 - Preliminary Evaluation	MB	03/30/22	Shear wave velocity needs to be collected to sufficient depth to establish a reference horizon for site response analysis required by Chapter 13 - Seismic. Consider whether guidance or requirements related to depth and frequency of shear wave velocity measurements in order to obtain adequate ground motions for the project.	05/25/22	MM	C	See revised Chapter 9, Geotechnical Requirements, §9.1.1: "Shear wave and P-wave velocity information must be collected to adequate depth to establish a reference horizon."	06/23/22	ROK	Agree, revision confirmed.				06/23/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 50
Comments Closed 50
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 11, Protection of Existing Infrastructure*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Sangyoon Min (Design Team)	SM	Fletcher Waggoner (CHSRA)	FW
Michael Bowers (CHSRA)	MB	Joel Pancoast (Caltrain)	JP
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Martin J. Walker (PMPC SME/Mott MacDonald)	MJW	Derek Penrice (PMPC SME/Mott MacDonald)	DP

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Cal.001	Chapter 11.1.1	JP	04/29/22	Geotech review	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.002	Chapter 11.1.1	JP	04/29/22	Including vertical and horizontal	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.003	Chapter 11.1.1	JP	04/29/22	TJPA approval	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.004	Chapter 11.1.2	JP	04/29/22	As defined in section 10.2	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.005	Chapter 11.1.2	JP	04/29/22	3rd party review	05/25/22	MM	C	Comment noted but not necessary to modify until third parties are identified.							05/25/22	CC
Cal.006	Chapter 11.1.3	JP	04/29/22	Surface and subsurface	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.007	Chapter 11.2	JP	04/29/22	Reference source of 1/8" criteria	05/25/22	MM	C	Revised to 1/4" per SME direction for this stage of design. The DTX Design Criteria will be updated prior to DB contractor selection with reference.							05/25/22	CC
Cal.008	Chapter 11.2	JP	04/29/22	Reference monitoring chapter 9, section 9.6	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.009	Chapter 11.2	JP	04/29/22	Cut-and Cover Structure heading for next subsection, number accordingly	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.010	Chapter 11.2	JP	04/29/22	For each structure considered	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.011	Chapter 11.2	JP	04/29/22	Geotechnical engineer and TJPA. (space)	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.012	Chapter 11.2	JP	04/29/22	Shall	05/25/22	MM	C	Verbiage has been selected and approved by TJPA, using the imperative "will" or "must"							05/25/22	CC
Cal.013	Chapter 11.2	JP	04/29/22	(bullet) Alternate method approved by TJPA	05/25/22	MM	A	Revised as noted, added new bullet: "Alternate method(s) approved by the TJPA"				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.014	Chapter 11.2	JP	04/29/22	Soil slope(s) to be determined by geotechnical engineer	05/25/22	MM	A	Figure 11.1 removed.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.015	Chapter 11.2	JP	04/29/22	Reference standard or guideline	05/25/22	MM	A	Figure 11.2 removed.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.016	Chapter 11.2.1	JP	04/29/22	Soil slope(s) to be determined by geotechnical engineer	05/25/22	MM	A	Figure 11.2 removed.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.017	Chapter 11.2.1	JP	04/29/22	Criteria established by design parameter, section 10.2	05/25/22	MM	C	Order of information does not require pointing backward in same chapter.							05/25/22	CC
Cal.018	Chapter 11.2.1	JP	04/29/22	Reference standard or design guideline	05/25/22	MM	A	This ratio is found in numerous technical papers. A reference will be included in the next revision of the DCM.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.019	Chapter 11.2.1	JP	04/29/22	Movements and the potential for'	05/25/22	MM	A	Revised as noted				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.020	Chapter 11.3	JP	04/29/22	Geotechnical engineer to determine slope of soil	05/25/22	MM	A	Figure 11.3 removed.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.021	Chapter 11.3	JP	04/29/22	Reference standard or design guideline	05/25/22	MJS	A	Figure 11.3 removed.				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.022	Chapter 11.3	JP	04/29/22	Revise; limits of the established design parameters, section 10.2.	05/25/22	MM	A	Revised to read as follows: "Protective works are required for infrastructure within the zone of influence of the cut-and-cover structures and tunnel where predicted values for movement exceed the limits of parameters established in section 11.2. "				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.023	Chapter 11.3	JP	04/29/22	Summary estimates shall be submitted to the TJPA for review	05/25/22	MM	A	Revised to read as follows: "A summary assessment for every building, utility, or other structure or facility within the zone of influence must be prepared for TJPA approval. The summary assessment must include an estimate as well as a description, category of potential damage, and proposed mitigations, including a recommendation for the use of protective works and the nature of the proposed protective works."				05/25/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/25/22	CC
Cal.024	Chapter 11 Section 11.2.1; (Page 11-4 of 6)	JP	06/30/22	omit sentence fragment at the end of the first paragraph	09/03/22	MJW	A	Fragment "Cut-and-Cover Structures" deleted. It appears formatting has gone awry in the document.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.001	Chapter 11 - General	LZ	07/04/22	Should have a more thorough description of the toolbox methods for protection of infrastructure	09/03/22	MJW	A	By not detailing the toolbox of methods available for protection of infrastructure, the design criterion leaves it to the designer to implement from their selection. As this will be a progressive design-build or design-build, these will be the responsibility of the designer to develop. However, the sentiment is not lost and language has been added to the Protective Works section, "The designer must develop a toolbox of methods to be implemented for protective works."	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.002	Section 11.2.1, Cut-and-Cover Structures	LZ	07/04/22	How will this work in practicality? What if the property owner wants settlement and rotation parameters that cannot be reasonably achieved?	09/03/22	MJW	A	The implementation of these agreements is beyond the scope of the DCM. I have deleted the "must be developed in conjunction with the owners of existing infrastructure." This way it just says that the TJPA will negotiate the agreement but that the designer has to develop the parameters of movement. This way it removes the implication that the owners have a say (in reality, they do of course - especially existing agencies with their own design criteria).	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.003	Section 11.2.2, Tunnel	LZ	07/04/22	The tunnels are not round, so they do not have a diameter (referring to 0.75D equation) need to specify the location of the measurement.	09/03/22	MJW	A	Revised to "For piles located within a 1:1 line extending upwards and outwards from the tunnel springline..." The team appreciates this catch.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.004	Section 11.3, Protective Works (first para)	LZ	07/04/22	States: " However, the implementation of protective works can cause deformations that may be as severe as the deformations that these measures are intended to mitigate". What is proposed to avoid those deformations to take place?	09/03/22	MJW	A	Added ", and this must be considered in the selection of protective works methods."				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.005	Section 11.3, Protective Works (second/third para)	LZ	07/04/22	TJPA approval could result in TJPA liability. how will this be avoided?	09/03/22	MJW	A	revised "approval" to "acceptance."				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

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GEC.001	Chapter 12 - Structures	MB	03/18/22	See tracked changes and review comments in "Chapter 11_Structures with MB comments.docx"	05/02/22	MJS	C	Captured in this CRL, See comments #GEC.013-GEC.022				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	Chapter 12 Figure 12.1	DL	03/15/22	The dimensions in the train diagram is blurry and not readable. The axle loads are provided in the text however the axle distances cannot be identified from the diagram	05/02/22	MJS	C	Critical dimensions are provided in table 2 - the image is only provided as a reference.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	Chapter 12_Structutres, 12.1.1, page 13-14 of 22	AEB	03/17/22	Suggest updating the cast-in-place substructure/superstructure concrete and shotcrete compressive strength to 5000 psi	05/13/22	NLV	B	Values listed are minimum f'c values. EOR may specify higher strength.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	Chapter 12_Structutres, 12.2.2.4, page 14 of 22	AEB	03/17/22	Suggest adding reference to ACI 318 in regards to bar lengths, laps, bends, etc.	05/13/22	NLV	B	Intent is to use LRFD Tunnels and CBDS for laps, bends, etc. ACI 318 left off in case there are any conflicting guidance or formulas. Open to discussion for next revision of DCM.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	Chapter 12 Codes and Standards, pg. 12-1	YS	12/10/21	Add the following: American Institute of Steel Construction (AISC). 2016. ANSI/AISC 360-16 – Specification for Structural Steel Buildings. ASTM International. ASTM A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.	05/13/22	NLV	A	Agree. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	Chapter 12, 12.2.2.2 Crack Width/Control	DMJ/KO	03/22/22	A state of the art waterproofing system is required. The waterproofing and the requirement for temperature and shrinkage reinforcement will adequately control cracking and provide the required water tightness. The exposure factor gamma_e should be specified taking the presence of the waterproofing System into account	05/13/22	NLV	B	Disagree. Crack width control, in addition to the waterproofing system, is an integral part of achieving design life goals.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	Ch 12, Page 11-1 of 19	YS	04/08/22	Add the following: American Institute of Steel Construction (AISC). 2016. ANSI/AISC 360-16 – Specification for Structural Steel Buildings. ASTM International. ASTM A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.	05/13/22	NLV	A	Agree. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	Ch 12, Page 11-2 of 19	YS	04/08/22	Suggest adding the following references: American Society of Civil Engineers. 2016. ASCE/SEI 7-22 – Minimum Design Loads for Buildings and Other Structures. The Concrete Society. 2007. Technical Report No. 63: Guidance for the Design of Steel-Fiber-Reinforced Concrete. John, Max, and Bruno Mattle. 2003. Shotcrete lining design: Factors of influence. In Proceedings of the Rapid Excavation and Tunneling Conference. 726–734. German Committee for Structural Concrete. 2015. DAfStb Guideline: Steel Fiber Reinforced Concrete. Bieniawski, Z.T. (1989). Engineering Rock Mass Classifications, New York: Wiley.	05/13/22	NLV	A	ASCE 7 is included in codes. Agree to Concrete Society Technical Report 63. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	12 - Codes and Standards, Sixth bullet (2019 SFBC)	MB	03/03/22	Is the version required if above says the latest edition?	05/13/22	NLV	A	Agree. Will remove the year from SFBC. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	12 - Codes and Standards, Seventh bullet (ASCE)	MB	03/03/22	Is the version required if above says the latest edition?	05/13/22	NLV	A	Agree. Will remove the version from ASCE. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	12 - Codes and Standards, Seventh bullet (ASCE)	MB	03/03/22	Add new sub-bullet "ASCE 41 Seismic Evaluation and Retrofit of Existing Buildings" The evaluation procedures are still applicable to new buildings, and this is a widely used national standard	05/13/22	NLV	A	Agree. Will add ASCE 41. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.012	12.1.2 - Concrete Reinforcing Steel, ASTM A706 Grade 80	MB	03/03/22	Grade 80 is often used for ties also, not just straight bars.	05/13/22	NLV	A	Agree. Will change clause. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.013	12.2.1.2 - Transient Loads, B - Live Load Surcharge (LS) (Minimum Life Load Surcharge, ¶3-1	MB	03/03/22	In regards to "600 psf for x < 5;" - Are bike lanes designed for this load also?	05/13/22	NLV	C	That is the intent.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

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GEC.014	12.2.1.2 - Transient Loads, F - Water Loads (WA, Waf, WAt), ¶3, Third bullet	MB	03/03/22	In regards to "100-year flood level" - And king tides and sea level rise?	05/13/22	NLV	C	That is the intent.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.015	12.2.1.4 - Buoyancy	MB	03/03/22	ASCE 7-16 2.3.1 Load Combinations for Strength Design specifies load factors of 1.6 when ground water effects, H, adds to the principal load effect, 0.9 when H resists the principal load effect and is permanent, and 0 for all other conditions.	05/13/22	NLV	B	Intent is to add a resistance to buoyancy global stability check in addition to what is required by AASHTO LRFD Tunnels + CBDS for cut-and-cover structures. For buildings and Miscellaneous Structures, CBC+SFBC load combinations would be applicable as per Sections 11.6 and 11.7.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.016	12.2.1.4 - Buoyancy, ¶3-2	MB	03/03/22	In regards to "depth of backfill calculated to resist.." - and groundwater?	05/13/22	NLV	C	Sentence referenced states to ignore the top 2 feet of backfill when calculating weight to resist buoyancy uplift. Groundwater elevation considered should be at the three levels listed at the beginning of the section.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.017	12.2.2.5 - Joints, A - Interface Joints, ¶2-3	MB	03/03/22	In regards to "See Chapter 10, Seismic Design, for additional requirements." - Is the seismic design criteria in Chapter 10?			A	Yes, Some of the Rev 01 chapters have been removed/combined, or re-ordered in Rev Book 02.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.018	12.3.4 - Loads, ¶1-2	MB	03/03/22	Is there still a Chapter 13? If not, where will the seismic design criteria be provided?			A	In the DTX Design Criteria Rev Book 02, Chapter 10 is Seismic Design. This reference will be updated in the final.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.019	Chapter 12, 12.2.1.2.A, pg. 11-9	BSP	04/25/22	Sidewalk LL - 600psf live load is significantly larger sidewalk LL than typically designed for (CBC sidewalk LL = 250psf). The Salesforce Transit Center Phase 1 design was designed for greater of AASHTO HL93 and 250psf. Recommend revising criteria to agree with the Phase 1 STC design.	05/13/22	NLV	A	Will revise to 250 psf pedestrian load and HS20-44 (non-concurrent) with direction on distribution of load through fill. Change complete.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.020	Chapter 11	PC	09/12/16	LEGACY Comment GEC16.056 - Add a sub-section describing Underground Structure Waterproofing design requirements	02/28/22	AK	C	Added reference to Table 2.6, Permissible Infiltration Rates for requirements, but will need further verification from SME to make sure these requirements are sufficient.		ROK	Agree and suggest to keep this open for further evaluation.				05/04/22	CC
GEC.021	Section 11.2.1.8	PC	09/12/16	LEGACY Comment GEC16.057 - Lateral Pressures: …….numerical analyses may be performed, and equivalent lateral earth pressure diagrams resulting from these analyses will be provided. When numerical analyses are performed, the load factor used for Active Pressure or Apparent Earth Pressure shall be used in the design.	02/28/22	AG	A	Added.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.022	Section 11.3.4	PC	09/12/16	LEGACY Comment GEC16.058 - In Ch. 2.7.1, it states ASD shall be used for temporary structures. Please state here ASD should be used for excavation support and then follow Table 11.5	02/28/22	AG	A	Added first sentence to first paragraph: "Allowable Stress Design (ASD) shall be used in the design for excavation support…".		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.023	Section 11.3.5	PC	09/12/16	LEGACY Comment GEC16.059 - Distinction…… The wall shall be designed to resist the loads from at rest earth pressure in the final long-term condition. At-rest earth pressure for all types of excavation supports are not practical. Please defer this to geotechnical report/memo.	02/28/22	AK/NLV	A	Modified sentence to say that permanent wall systems to be designed for at-rest wall pressures.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.024	Page 11-1 of 26	HC	09/12/16	LEGACY Comment GEC16.060 - Under the sub-heading of Scope, "passenger stations, support of excavation, U-walls, earth-retaining structures, ventilation and egress structures, buildings and miscellaneous structures" are lumped under "cut-and-cover structures". It is probably not intended. Please revise to clarify.	02/28/22	AG	A	Revised to read: "TJPA-owned facilities including cut-and-cover structures, passenger stations, support of excavation…"		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.025	Section 11.1.1 Page 11-1 of 26	HC	09/12/16	LEGACY Comment GEC16.061 - Under the sub-heading of 11.1.1, "Concrete": Please confirm if only normal weight aggregates are allowed, and no light weight aggregates are allowed.	02/28/22	NLV	C	No lightweight aggregates are allowed.		ROK					05/04/22	CC
GEC.026	11.2.1.1 Page 11-4 of 26	HC	09/12/16	LEGACY Comment GEC16.062 - Under the sub-heading of, 11.2.1.1, "Dead Loads": Please consider revising "stair stringers" to "stairs and landings".	02/28/22	AG	A	Revised.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.027	Section 11.2.1.1 Page 11-4 of 26	HC	09/12/16	LEGACY Comment GEC16.063 - Under the sub-heading of 11.2.1.1, "Superimposed Dead Load – Buildings": Please clarify if concentrated loads, including seismic loads, from buildings should be considered for cut-and-cover structure design. Please also clarify how the cut-and-cover structure design could accommodate future additions for seismic resisting systems of the supported buildings when they undergo seismic strengthening work.	02/28/22	NLV	A	Section has been revised to refer to the TOD directly. For the first question: The load paths and distribution of loads from the TOD structure to the cut-and-cover structure must be congruent between the two designs. Load path from the TOD Structure through the cut-and-cover structure must be continuous and consistent, i.e. the reaction loads from the TOD structure should tie in as applied loads to the TOD structure. Furthermore, the reactions from the seismic-resisting system of the TOD should also be applied to the cut-and-cover structure. However, this is beyond the scope of this Chapter. See Chapter 13 Seismic Design. For the second question: Future additions/retrofits by others outside of the scope of the current project configurations is not in the scope of this Design Criteria.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.028	Section 11.2.1.12 Page 11-9 of 26	HC	09/12/16	LEGACY Comment GEC16.064 - Under the sub-heading of 11.2.1.12, "Collision Loads": Please clarify the first sentence regarding where "raised walkways or guard rails are provided". For example, if a U wall structure has raised walkway and guard rails above the top of U wall, is U wall exempt from collision load requirement?	02/28/22	NLV	A	Now under Section 11.2.1.2.6 Collision Loads. Section modified to refer back to AREMA and CBDS for collision loading.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC

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GEC.029	Section 11.2.1.14 Page 11-10 of 26	HC	09/12/16	LEGACY Comment GEC16.065 - Under the sub-heading of "11.2.1.14, "Load Factors and Combinations": For 500-year flood condition, please clarify the discrepancy between load factor of 1.0 (D + E + B) vs. the load factor of 1.02 for 500-year flood load shown in Page 11-11 of 26.	02/28/22	NLV	A	Section changed to use AASHTO LRFD Tunnels Guide Specifications load factors and load combinations		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.030	Section 11.3 (Table) Page 11-10 of 26	HC	09/12/16	LEGACY Comment GEC16.066 - Under the sub-heading of Chapter 11-Structures, Table 11.3, "Allowable Stress Load Factors and Combination": Allowable Percentage of Basic Unit Stress is 125. Please clarify if newer provisions of ASCE 7-16 where the allowable percentage is now 120 should be considered.	02/28/22	NLV	A	Section changed to use AASHTO LRFD Tunnels Guide Specifications load factors and load combinations		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.031	Page 11-11 of 26	HC	09/12/16	LEGACY Comment GEC16.067 - Under the sub-heading of "Case 2 and Case 3": Please clarify if earthquake forces should be considered.	02/28/22	NLV	C	Section removed from this Chapter.		ROK					05/04/22	CC
GEC.032	Section 11.2.1.15 Page 11-11 of 26	HC	09/12/16	LEGACY Comment GEC16.068 - Under the sub-heading of 11.2.1.15, "Buoyancy": Please see comment 7 for possible discrepancy with 11.2.1.14.	02/28/22	NLV	C	For permanent construction, a buoyancy factor of safety of 1.10 applies to the normal high-water level.		ROK					05/04/22	CC
GEC.033	Section 11.2.1.15 Page 11-12 of 26	HC	09/12/16	LEGACY Comment GEC16.069 - Under the sub-heading of 11.2.1.15, "Buoyancy": During construction, a safety factor of 1.10 is required for buoyancy. Please clarify if a similar safety factor is needed for permanent construction.	02/28/22	NLV	C	For permanent construction, a buoyancy factor of safety of 1.10 applies to the normal high-water level.		ROK					05/04/22	CC
GEC.034	Section 11.4 Page 11-13 of 26	HC	09/12/16	LEGACY Comment GEC16.070 - Under the sub-heading of Table 11.4, "Minimum Concrete Cover to Reinforcement": Please clarify minimum concrete cover for pre-stress tendons. Depending on the type of aggregates and fire rating, minimum concrete cover could differ.	02/28/22	NLV	A	This section has been changed to follow California Bridge Design Specification (CBDS).		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.035	Section 11.2.2.2.4 Page 11-15 of 26	HC	09/12/16	LEGACY Comment GEC16.071 - Under the sub-heading of 11.2.2.2.4, "Detailing": Please clarify requirement for a "closed loop" in the last sentence. Please clarify if hoops with alternating hair pins having 135 and 90 degree hooks (common practice in the industry to allow ease of primary rebar installation) are acceptable in lieu of "closed loop" ties.	02/28/22	NLV	A	This clause applies to beam elements like rectangular beams. The requirement states that any beam cross sections must have a closed loop shear stirrup. Added clause to include shear reinforcement in walls and slabs with alternating hooks, as suggested.		PAR	ACI 318-19 Section 18.6.4.3: Hoops in beams shall be permitted to be made up of two pieces of reinforcement: a (U-shaped) stirrup having seismic hooks at both ends and closed by a crosstie Closed hoops are required at columns and wall boundary elements to provide confinement.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.036	Section 11.5 Page 11-18 of 26	HC	09/12/16	LEGACY Comment GEC16.072 - Under the sub-heading Table 11.5, "Design Load Combinations for External Support (for Temporary Structures using Steel Members)": For deck beams and horizontal supporting framework a live load of 100 psf has been specified for sidewalks. Please revise to 250 psf live load for sidewalks as required by building code.	02/28/22	NLV	B	Disagree. The applicable code for Street and Sidewalk Decking is CBDS. However, it is at the discretion of the Designer to use a greater load.		PAR		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.037	Section 11.5 (Table) Page 11-18 of 26	HC	09/12/16	LEGACY Comment GEC16.073 - Under the sub-heading of Chapter 11-Structures, Table 11.5, "Design Load Combinations for External Support (for Temporary Structures using Steel Members)": For railing, there is a typo under the column of vertical load: CBS should be revised to read as CBDS.	02/28/22	AK	A	Agreed. Table 11.5 has been fixed.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.038	Section 11.3.10.3 Page 11-21 of 26	HC	09/12/16	LEGACY Comment GEC16.074 - Under the sub-heading of 11.3.10.3, "Excavation Base Stability": All provisions shown appear to be for geotechnical engineering rather than structural. Please consider moving this provision to Chapter 9.	02/28/22	NLV/MJW	A	Agree. Section 11.3.10.3 Excavation Base Stability has been moved to Chapter 9 Geotechnical Design.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.039	Section 11.4.7.3 Page 11-23 of 26	HC	09/12/16	LEGACY Comment GEC16.075 - Under the sub-heading of 11.4.7.3, "Stability-Sliding": The provision to disregard 3 ft. of earth above the base slab for sliding resistance is confusing as there is usually no earth above base slab. Please clarify.	02/28/22	NLV	A	Agreed. Will revise to read that top 3 ft of cover at finished grade in front of wall (toe side) is to be ignored for sliding stability check.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.040	Section 11.5.3 Page 11-24 of 26	HC	09/12/16	LEGACY Comment GEC16.076 - Under the sub-heading 11.5.3, "Buoyancy": Please clarify how "existing factors of safety against hydrostatic uplift" could be ascertained.	02/28/22	NLV	C	Determine the existing factor of safety resisting hydrostatic uplift. That calculated existing factor would be the factor of safety to design for.		ROK		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.041	Page 11-18 of 26	HC	09/12/16	LEGACY Comment GEC16.077 - Under the sub-heading of "Scope": Revise the last sentence of the first paragraph to read, "In addition, criteria for temporary structures…, are provided herein."	02/28/22	AK	A	Added "Temporary structures and…" to the beginning of the second bullet point in the first paragraph of the Scope section.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.042	Chapter 11 Standards	KA		LEGACY Comment GEC18.051 - AASHTO is the most common standard for underground structures	02/28/22	NLV	A	Agree. Will revise to include AASHTO LRFD Road Tunnel Design and Construction Guide Specifications. AASHTO LRFD Tunnel should be used for tunnel design principles. AREMA will supersede AASHTO LRFD Tunnel for loading and checks and should be used for design.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.043	DC 11.1.1	PC		LEGACY Comment GEC18.052 - Add "Precast Concrete: suggest 5,000 psi min.	02/28/22	NLV	A	Agree - updated per comment.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.044	11.1.2	KA		LEGACY Comment GEC18.053 - Higher yield rebar is becoming common. ACI provides design max yield. Verify those values are acceptable	02/28/22	NLV	C	ASTM A706 Gr 80 may be used for straight bars in capacity protected members only. Grade 80 bars are not be used in Seismic Critical Members. See CBDS and Caltrans Seismic Design Criteria for more information. Clause edited to reflect Caltrans SDC allowed usage and to reference Caltrans SDC for information.		ROK	No additional comment				05/04/22	CC
GEC.045	11.1.2	DMJ		LEGACY Comment GEC18.054 - Allow the use of grade 75 or 80 A706 reinforcing in non-ductile elements	02/28/22	NLV	C	ASTM A706 Gr 80 may be used for straight bars in capacity-protected members only. Grade 80 bars are not to be used in Seismic Critical Members. See CBDS and Caltrans Seismic Design Criteria for more information.		ROK					05/04/22	CC
GEC.046	DC 11.1.2	PC		LEGACY Comment GEC18.055 - Add "Steel Fibers conforming to ASTM A820	02/28/22	NLV	B	Section revised - Concrete Reinforcing Steel must conform to ASTM A706.		PAR	How about steel fibers?	05/26/22	MM	Will be evaluted in next revision of DCM.	05/26/22	CC
GEC.047	11.1.4 anchor bolts	KA		LEGACY Comment GEC18.056 - There may reasons to use anchor bolts other than A449; seems too restrictive.	02/28/22	NLV	A	Section changed to require ASTM F1554, which complies with CBDS and is the AISC preferred material specification.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.048	11.1.4 steel connections	KA		LEGACY Comment GEC18.057 - Setting 7/8" as the standard bolt diameter is not good practice. Designer should be allowed to use 1 ¼" or 5/8" if the situation calls for it.	02/28/22	NLV	A	Agree. Clause changed to read as 5/8" dia bolt is the minimum diameter.		ROK	No additional comment	05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.049	11.2.1	DL		LEGACY Comment GEC18.058 - Provisions for wind load which is not found which is required for above-ground structure and their foundation.	02/28/22	NLV	A	Agreed. In addition, piston action of trains should be included. Section 11.2.1 specifies minimum loads. Designer may consider other loads at their discretion.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.050	11.2.1.1	DMJ		LEGACY Comment GEC18.059 - Delete the maximum number of building stories for dead load	02/28/22	NLV	A	Agreed. The requirement for a maximum number of stories has been removed and replaced with direct reference of the TOD.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 123
Comments Closed 123
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 12, Structures*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Andrew Baltay (Design Team/MJA)	AEB	Margaritte Bello (Design Team)	MB
Y. Sun (Design Team/MJA)	YS	Fletcher Waggoner (CHSRA)	FW
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Noel Vivar (PMPC SME/Mott MacDonald)	NLV	Amanda Kaku (PMPC/HCI)	AK

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OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
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GEC.051	11.2.1.8 backfill weight	KA		LEGACY Comment GEC18.060 - The 130 pcf would prevent designer from using foam blocks or cellular fill to reduce overburden. Is that the intent?	02/28/22	NLV	B	Disagree. 130 pcf would be the best practice to ensure robustness and future-proof the design of the cut-and-cover structure against any future fills. Furthermore, foam fill is not recommended in urban areas since it may dissolve in the presence of chemicals from roadways. If there are specific areas that will not have adverse exposure to chemicals, a design variance may be requested.		ROK	No additional comment				05/04/22	CC
GEC.052	11.2.2.1 Table 11.4	DL		LEGACY Comment GEC18.061 - There are some N/A for precast concrete. Does that mean the use of precast concrete is excluded in such application? Also, does the cover for CIP concrete also applies to pre/post tensioning strands and ducts (such as CIP PT roof slab)?	02/28/22	NLV	A	Table 11.4 has been removed and replaced by a reference to CBDS minimum concrete cover.		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.053	11.2.2.2	DMJ		LEGACY Comment GEC18.062 - Delete crack width limit check – with properly designed, detailed and waterproofed structure limit has minimal additional value	02/28/22	NLV	B	Disagree. Both crack control and waterproofing membrane are useful for designing watertightness. [NLV ed. to be confirmed with Waterproofing SME.]		PAR	Discussion required. Waterproofing requirement is sufficient.	05/26/22	MM	Will be evaluted in next revision of DCM.	05/26/22	CC
GEC.054	11.2.2.5	DL		LEGACY Comment GEC18.063 - Movement joint required at significant cross section change. This might introduce difficulty in throat section and interrupts structural continuity of the throat section.	02/28/22	NLV	A	Agreed - Section modified per comment		ROK		05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.055	11.2.1.3	DMJ	11/02/21	LEGACY Comment GEC21.001 - Revise Criteria in Section 11.2.1.3 to say, "Roadway live loads shall be per AASHTO LRFD 8th Edition with Caltrans Amendments."	02/28/22	AK	A	Revised.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.056	11.2.1.4 (new section)	DMJ	10/28/21	LEGACY Comment GEC21.002 - Clarify the live loads for the cut-and-cover structures that will support the future TOD. (see email from David Jones - 10/28)	02/28/22	AK	A	Added a new section that includes the live load factors for the future TOD.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
GEC.057	12.2.1.4	MB	08/03/22	Reference to Table 11.1 should be Table 12.1.	09/02/22	NLV	A	Table reference corrected.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.058	12.2.1.3, Load Factors and Combinations (first sentence)	MB	08/17/22	There should be no "s" after AASHTO and the Table reference (currently "Table 3.4.11") should be "Table 3.4.1"	09/02/22	NLV	A	Revised section as noted, and corrected AASHTO Table reference.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

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Review Comment Sheet

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Comments Closed	**123**
% Complete	**100%**

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HSR.001	12.1.7, Table 11-1	FW	03/28/22	Unit weights for CHSR application missing (electrification, OCS poles, cable trough, etc.), refer to current CHSR criteria.	05/13/22	NLV	DE	Section is for materials unit weights. Comment more applicable to Section 11.2.1.1 Superimposed Dead Loads. Will include clause in 11.2.1.1 Superimposed Dead Loads to use actual weights of components and make reference to CHSRA Design Criteria for weights of components are not known. Marked as "DE" to flag that change has been made in a different section than where commentor proposes. Change complete.	06/23/22	ROK	Agree, revision confirmed.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.002	12.1.8	FW	03/28/22	Sheet waterproofing membranes with specific performance requirements are specific on CHSR tunnels, refer to CHSR criteria for details.	05/13/22	NLV	B	TJPA has prepared a project-specific design criteria in accordance with applicable codes. TJPA has reviewed the CHSRA against the DTX criteria and considers the DTX criteria provided acceptable practice.	06/23/22	ROK	Ok, I was only pointing out CHSR's waterproofing performance requirements for comparison.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.003	12.1.8 & 12.2.2.1	FW	03/28/22	CHSR criteria has minimum concrete cover requirements for application type & noncorrosive or corrosive environments, refer to CHSR criteria for details.	05/13/22	NLV	B	TJPA has prepared a project-specific design criteria in accordance with applicable codes. TJPA has reviewed the CHSRA against the DTX criteria and considers the DTX criteria provided acceptable practice.	06/23/22	ROK	Ok, I was only pointing out CHSR's minimum cover requirement for comparison.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.004	12.2.1.1	FW	03/28/22	"Loading missing from this Permanent Loads section include: 1 locked-in construction forces 2. creep effects 3. settlement effects Verify if no amendments needed to AASHTO LRFD Tunnels for these. Refer to CHSR criteria for additional guidance, if applicable. Note that CHSR criteria includes water loads (WA) as permanent loading. "	05/13/22	NLV	B	Loads listed in the section describe minimum loading outside of what would be considered in AASHTO LRFD Tunnels + CBDS. Loads are still required to be considered in AASHTO LRFD + CBDS.	06/23/22	ROK	Agree, it unstated loads occur then AASHTO LRFD Tunnels + CBDS can cover application & appropriate load factors.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.005	12.2.1.1.A	FW	03/28/22	CHSR criteria has detailed OCS Support & fixed equipment loads and loading diagrams, refer to CHSR criteria for details.	05/13/22	NLV	DE	Will include reference to CHSRA DCM for OCS & fixed equipment loading diagrams in Section 11.2.1.1.A (not .B). Marked as "DE" to flag that change has been made in a different section than where commenter proposes. Change complete.	06/23/22	ROK	Agree, revision confirmed.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.006	12.2.1.2	FW	03/28/22	"Loading missing from this Transient Loads section include: 1 nosing/hunting effects 2. derailment loads 3. thermal loads 4. fire loads Verify if no amendments needed to AASHTO LRFD Tunnels for these. Refer to CHSR criteria for guidance, if applicable. "	05/13/22	NLV	DE	Will evaluate each of the loads listed for inclusion. Assessments for fire performance are in progress as part of the Threat and Vulnerability Assessment.	06/23/22	BCC	Item remains open pending review of next revision. Not addressed in June 1, 2022 version.	09/02/22	NLV	Nosing and hunting load has been added. Derailment load has been added. Thermal load is covered by AASHTO Tunnel LRFD and CBDS. No additional description of load is needed by this document. Assessments for fire performance are in progress as part of the Threat and Vulnerability Assessment.	09/07/22	CC
HSR.007	12.2.1.3	FW	03/28/22	"I believe you mean Table 3.4-1 ? Extreme Event T-I, EQ = 1.0 Will this apply to both the FEE & SEE ? In CHSR, the lower level functional (operational) event is a separate Strength load case, refer to CHSR."	05/13/22	NLV	A	Re: table reference. Agree. Change complete. Re: Load Cases and FEE/SEE. Will evaluate for next revision.	06/23/22	ROK	Agree. Recommend specifying separate load combinations for FEE & SEE (i..e.: Exterme Event T-1a for FEE, T-1b for SEE, or similar)	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	09/07/22	CC
HSR.008	12.2.1.4	FW	03/28/22	"Do AASHTO Tunnels buoyancy related load cases T-1A (service), and T-II (construction) apply to this section ? T-1A has a load factor of 0.9 (DL) & 1.1 (WA). The factor of safety commentary here seems to duplicate the WA load factor The CHSR criteria has a higher WA load factor of 1.25 than AASHTO Tunnels for T-1A.. "	05/13/22	NLV	B	Intent is to add a resistance to buoyancy global stability check in addition to what is required by AASHTO LRFD Tunnels + CBDS for cut-and-cover structures. TJPA has prepared a project-specific design criteria in accordance with applicable codes. TJPA has reviewed the CHSRA against the DTX criteria and considers the DTX criteria provided acceptable practice.	06/23/22	BCC	Disagree, if the global stabililty check is in addition to AASHTO LRFD Tunnels then recommend creating an applicable load case with applicable load factors.	09/02/22	NLV	Agree now. The clause giving bouyancy global factors of safety has been removed. In its place, the AASHTO LRFD Load combination Service T-IA has been changed such that the WA Load Factor = 1.25.	09/07/22	CC
HSR.009	12.2.2.4	FW	03/28/22	"For cut-and-cover tunnels, additional CHSR requirements are: 1. minimum of two layers of reinforcement at the interior and exterior faces (i.e.: double curtain). 2. for the SEE, targeted regions for plastic hinges are in the walls, with the adjacent roof/invert slab capacity protected (perhaps a more appropriate issue for the seismic chapter)"	05/13/22	NLV	A	Will include double layer reinforcement requirement. Change complete.	06/23/22	ROK	Agree, revision confirmed.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.010	12.5	FW	03/28/22	"Railway bridges do not appear to be in the DTX project scope. However, CHSR bridge criteria has substantially more requirements than AREMA, in particular a slew of Track-Structure Interaction requirements (i.e.: target structural frequency thresholds, track serviceability limits, RSI limits, and dynamic structural analysis limits)"	05/13/22	NLV	C	Section is speaking to any pedestrian bridges constructed, temporary bridges constructed, and Caltrans bridge modifications necessary for the project.	06/23/22	ROK	Agree, revision confirmed. Assuming no CHSR bridge part of project.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.011	12.9	FW	03/28/22	CHSR criteria infiltration limit is more stringent at 0.0002 gal/sf/day for all tunnels/underground structures with no "water tightness class" distinctions.	05/13/22	NLV	B	TJPA has prepared a project-specific design criteria in accordance with applicable codes. TJPA has reviewed the CHSRA against the DTX criteria and considers the DTX criteria provided acceptable practice.	06/23/22	ROK	Ok, I was only pointing out CHSR's more stringent infiltration limits for comparison.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.012	Section 12.2.1.2, 11-5	MBr	10/01/18	LEGACY Comment HSR18.046 - 11.2.1.2 Rail Live Loads - Muni new Siemen vehicle should be included.	02/28/22	MJS	A	Seimens' S200 SF Light Rail Vehicle (LRV) standard specifications (vehicle dimensions and weight) added for consideration/load calculations. Length over coupler: 75.0' Width: 104.32" Height with Pantograph: 11.5' Track gauge: 4'-8/5" Wheel Base: 6.2' (power trucks) Vehicle empty weight: 76,000lbs				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

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Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Andrew Baltay (Design Team/MJA)	AEB	Margaritte Bello (Design Team)	MB
Y. Sun (Design Team/MJA)	YS	Fletcher Waggoner (CHSRA)	FW
Joel Pancoast (Caltrain)	JP	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Noel Vivar (PMPC SME/Mott MacDonald)	NLV	Amanda Kaku (PMPC/HCI)	AK

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B – Responder disagrees for reasons noted
C – Answer provided; no action needed
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ROK – response okay
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
Cal.001	Chapter 11	JP	04/29/22	coordinate chapter title and number	05/13/22	MM	A	Seismic Design will be Chapter 10 in the DTX Design Criteria Revision Book 02. The file name and number were carried over from previous revision (REV 01). Chapter, section, and subsection numbering have been updated accordingly.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.002	Chapter 11	JP	04/29/22	(bullet) ACI 533.5R Guide for Precast Concrete Tunnel Segments	05/13/22	NLV	A	Will add reference to list of Codes & Standards in Chapter 13 Tunnels.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.003	Chapter 11.1	JP	04/29/22	reference project specifications	05/13/22	NLV	C	This section is stating minimum material properties for the designer to then create drawings and specs for.							05/13/22	CC
Cal.004	Chapter 11.1.8	JP	04/29/22	waterproofing to be designed by qualified expert with experience	05/13/22	NLV	B	Qualifications requirements are better suited to a Technical Requirements or Specifications document. Suggest to leave off Design Criteria, but include in Technical Requirements or Specifications.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.005	Chapter 11.1.8	JP	04/29/22	TJPA approval	05/26/22	MM	A	Revised as follows: "Underground structures must be designed to be completely waterproofed and must be approved by the TJPA."				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.006	Chapter 11.2.1	JP	04/29/22	include; AREMA	05/13/22	NLV	B	Not sure how AREMA is to be included in subsection 11.2.1 Loads and Forces. AREMA is already generally referred to in the parent section 11.2. Furthermore, loads listed in 11.2.1 are minimum loads augmenting what would be found in AREMA and AASHTO LRFD Tunnels + CBDS.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.007	Chapter 11.2.1.1	JP	04/29/22	revise; within the zone of influence, reference chapter 10	05/13/22	NLV	A	Comment later clarified. Will add suggested verbiages with slight word change for consistency with Chapter 10. Change complete.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.008	Chapter 11.2.1.1	JP	04/29/22	engineer to develop report for each existing building detailing source of building information, approximated dead and live loads, etc.; provide all existing building reports to TJPA for review	05/13/22	NLV	DE	Will evaluate. May be better suited to Specifications or Technical Requirements documents.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.009	Chapter 11.2.1.1	JP	04/29/22	revise; engineers existing building report	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.010	Chapter 11.2.1.1	JP	04/29/22	provide justification for 1,600 psf load	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision. 1,600 psf load meant to simulate load from future development and has been used in past projects. Will evaluate giving justifications for chosen value of future development load.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.011	Chapter 11.2.1.2	JP	04/29/22	reference standard or design guideline for values indicated	05/13/22	NLV	A	Muni Design Criteria added to Codes and Standards section				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.012	Chapter 11.2.1.2	JP	04/29/22	subheading; Impact Load	05/13/22	NLV	A	Comment later clarified. Agree. Change complete.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.013	Chapter 11.2.1.2	JP	04/29/22	reference standard or guideline	05/13/22	NLV	A	Added citation				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.014	Chapter 11.2.1.2	JP	04/29/22	move this sentence up to Impact Load	05/13/22	NLV	DE	Clarification of original comment and revision update will occur at next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.015	Chapter 11.2.1.2	JP	04/29/22	reference standard or guideline	05/13/22	NLV	DE	Comment later clarified to be in reference to Pedestrian Area Live Loads section. Pedestrian Area Live Loads section referenced substantially changed. Commenter to review new verbiage. Change complete.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.016	Chapter 11.2.1.2	JP	04/29/22	include; AREMA	05/13/22	NLV	C	Section already references AREMA for Caltrain.							05/26/22	CC
Cal.017	Chapter 11.2.1.4	JP	04/29/22	considering sea-level rise over service life	05/13/22	NLV	A	Agree. Will modify clause. Change complete.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.018	Chapter 11.2.1.4	JP	04/29/22	reference standard or guideline	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.019	Chapter 11.2.1.4	JP	04/29/22	TJPA approval	05/26/22	MM	A	Will add TJPA approval of variances is required.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.020	Chapter 11.2.2.1	JP	04/29/22	include additional information regarding protection of exposed structural steel elements; painting, galvanization, use of weathering or stainless steels, etc.	05/13/22	NLV	DE	Will evaluate. Design life is defined as 150 years as per AASHTO LRFD Tunnels. Designer will need to satisfy design life requirements.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.021	Chapter 11.2.2.2	JP	04/29/22	other reinforcing minimums per ACI or other referenced standards	05/13/22	NLV	DE	Section 11.2 is for cut-and-cover structures. Would first reference AASHTO LRFD Tunnels + CBDS + AREMA requirements. ACI requirements can be referenced in 11.6 buildings.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.022	Chapter 11.2.2.5	JP	04/29/22	engineer of record to approve location of all construction joints	05/13/22	NLV	A	Will include requirement. Change complete.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.023	Chapter 11.3.1	JP	04/29/22	revise; within zone of influence	05/13/22	NLV	A	Comment later clarified. Agree. Change complete.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.024	Chapter 11.3.2	JP	04/29/22	include; geotechnical engineer and	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.025	Chapter 11.3.2	JP	04/29/22	include; and conforming to the design parameters per section 10.2	05/13/22	NLV	DE	Need clarification on comment.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.026	Chapter 11.3.2	JP	04/29/22	designs for shoring supporting adjacent structures to be reviewed by TJPA	05/26/22	MM	A	Will add TJPA approval of variances is required.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.027	Chapter 11.3.2	JP	04/29/22	revise; 10 feet below the excavation depth, but not less than 2 feet.	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.028	Chapter 11.3.2	JP	04/29/22	subheading; Underpinning	05/13/22	NLV	A	Comment later clarified. Agree. Change complete.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.029	Chapter 11.4.6	JP	04/29/22	TJPA approve	05/26/22	MM	A	Will add TJPA approval of variances is required.				05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.030	Chapter 11.9	JP	04/29/22	this sentence appears to conflict with Table 11-3	05/13/22	NLV	DE	Comment later clarified. Designer will evaluate for next revision.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
Cal.031	Chapter 11.10	BZ	04/29/22	Specify the slope requirement of the positive drainage.	05/13/22	NLV	DE	Will evaluate.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 123
Comments Closed 123
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 12, Structures*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Andrew Baltay (Design Team/MJA)	AEB	Margaritte Bello (Design Team)	MB
Y. Sun (Design Team/MJA)	YS	Fletcher Waggoner (CHSRA)	FW
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Cal.032	Section 11.1.4	ZB	10/18/18	LEGACY Comment Cal18.034 - Section 11.1.4 Structural Steel Connections (highlighted text - "ASTM A449") May add ASTM F1554 for more suitable application.	02/28/22	MJS	A	ASTM F1554 "Standard Specification for Anchor Bolts, Steel, 36, 55, and 105ksi Yield Strength" will be added to the reference list.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.033	Section 11.2.1.2	ZB	10/18/18	LEGACY Comment Cal18.035 - Section 11.2.1.2 Rail Live Loads (third paragraph, highlighted text - "The effects of impact load associated with live load shall not be considered on base slabs that are in direct contact with earth unless they are pile-supported." For the direct fixation tracks, the design of the slab shall consider the live load impact. See AREMA Chapter 8 - 27.5.4.C.	02/28/22	NLV	A	Agree. Propose to remove the paragraph and let Designer follow AREMA.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.034	Section 11.2.1.12	ZB	10/18/18	LEGACY Comment Cal18.036 - Section 11.2.1.12 (second sentence, highlighted text - "..225 kips." Provide additional data to support the conclusion.	02/28/22	NLV	A	Agree. Clause removed and replaced with direction - designer to follow AREMA collision loading.				05/13/22	MM	The responder (PMPC Team) agreed to update per original comment. Caltrain did not provide any backcheck response and therefore this comment is considered closed.	05/13/22	CC
Cal.035	Chapter 12 Section 12.1.1; (Page 12-3 of 22)	JP	06/30/22	5000psi shotcrete used for Tunnels per 334.1.1 SEM Draft Tunnel	09/02/22	NLV	B	Section is only giving minimum strengths. Designers are able to use a higher strength if they deem necessary.	10/05/22	JP	PMPC comment response is acceptable, comment is considered closed.	10/05/22	MJS	The responder (PMPC Team) received email notification from Caltrain (Pancoast) on 10/5 confirming acceptance of comment response.	10/05/22	CC
Cal.036	Chapter 12 Section 12.2.1.1, B; (Page 12-6 of 22)	JP	06/30/22	last sentence of first paragraph; revise 'Table 11.1' to Table 12.1	09/02/22	NLV	A	Table reference changed.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.037	Chapter 12 Section 12.2.1.1, E Existing Building Earth Surcharge; (Page 12-7 of 22)	JP	06/30/22	first sentence; revise 'Chapter 10' to Chapter 11	09/02/22	NLV	A	Chapter reference changed.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.038	Chapter 12 Section 12.2.1.1, E Adjacent and Future Development Earth Surcharge; (Page 12-7 of 22)	JP	06/30/22	The justifications for chosen value (1,600 psf) representing future development load shall be added to next revision.	09/02/22	NLV	B	TJPA has prepared a project-specific design criteria in accordance with applicable codes and local practice.	10/05/22	JP	PMPC comment response is acceptable, comment is considered closed.	10/05/22	MJS	The responder (PMPC Team) received email notification from Caltrain (Pancoast) on 10/5 confirming acceptance of comment response.	10/05/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 123
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% Complete 100%

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TA.001	Chapter 12, Structures (Scope)	LZ	07/04/22	Add a bullet: design of structures owned by others that may need to be modified as a result of the project	09/02/22	NLV	B	"facilicties owned by others" is covered in 2nd bullet in the current copy. Clarification needed.	10/05/22	LZ	TA would like to be clear that criteria include permanent structures/facilities in language	10/11/22	MJS	The second bullet under "Scope" has been revised as follows: "•Temporary structures and permanent facilities owned by others that are constructed or modified as part of the DTX project, including bridges, passenger stations, buildings, and miscellaneous structures." The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/11/22	CC
TA.002	Section 12.1.8, Waterproofing	LZ	07/04/22	Waterproofing design has to address potential leakage resulting from improper membrane installation	09/02/22	NLV	B	Improper constuction and installation repairs will be addressed in Specifications and Technical Requirements.	10/05/22	LZ	Based on experience, waterproofing is never perfect regardless of effort.	10/05/22	MJS	The responder (PMPC Team) has agreed to develop requirements for waterproofing system and failure repair procedures. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
TA.003	Section 12.1.8, Waterproofing (Third bullet)	LZ	07/04/22	Water barriers or waterstops?	09/02/22	NLV	A	Revised all references to element to "waterstops"				10/05/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/05/22	CC
TA.004	Section 12.1.8, Waterproofing (Second para)	LZ	07/04/22	States: "Where reinforced concrete is to be placed against the waterproofing membrane, no damage to the exposed membrane surface that would permit seepage through the membrane is allowed". This is the achilles heel of membrane waterproofing. Damage that is not easily detected and can esily occur, specially during rebar installation. If membrane waterproofing is to be used, there needs to be a requirement that very strict QA/QC procedures must be developed and monitored.	09/02/22	NLV	B	Improper constuction and installation repairs will be addressed in Specifications and Technical Requirements.	10/05/22	LZ	During CRM with SF CTA on 10/5, it was agreed that stringent quality requirements for the waterproofing system will be covered under technical specifications during the next phase of design.	10/05/22	MJS	The responder (PMPC Team) has agreed to develop requirements for waterproofing system and failure repair procedures. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
TA.005	Section 12.2.1.1, Permanent Loads (B. Superimposed Dead Loads) (Third para)	LZ	07/04/22	States: "In addition, in the absence of known loads and loading patterns of proposed CHSR OCS components and fixed equipment." This is incorrect. The CHSR loads and loading patterns are known, since they apply to the blended systen under which they will operate with Caltrain. CHSR will be using the Caltrain OCS components and fixed equipment	09/02/22	NLV	B	CHSRA DCM loading patterns are used as fallback and are referenced in this paragraph.	10/05/22	LZ	During CRM with SF CTA on 10/5, this presents confusion to reader - there will be no CHSRA specific equipment within the DTX ROW (other than the potential for CHSRA signaling approach).	10/05/22	MJS	The responder (PMPC Team) revised response during CRM on 10/5 and agreed to update per original comment; therefore this comment is considered closed.	10/05/22	CC
TA.006	Section 12.2.1.1, Permanent Loads (Adjacent and Future Development Earth Surcharge)	LZ	07/04/22	States ; "where there is potential for future development, use the surcharge from the actual development" If the development is potential, how could the actual surcharge from the development be used? Need a method to determine the potential surcharge based on zoning (eg, the maximum-size development allowed) or other means	09/02/22	NLV	A	Section re-written to specify unloading and loading scenarios.	10/05/22	LZ	During CRM with SF CTA on 10/5, resolution was met.	10/05/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/05/22	CC
TA.007	Section 12.2.1.1, Permanent Loads (F. Shrinkage - Table 12-2:Muni LRV Models)	LZ	07/04/22	The table and following text do not have an introduction as to the subject. It appears to be the Muni bridging structure, but there's no reference	09/02/22	NLV	B	Comment needs clarification. No table in current copy.	10/05/22	LZ	During CRM with SF CTA on 10/5, resolution was met with added table name.	10/05/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/05/22	CC
TA.008	Section 12.2.1.1, Permanent Loads (F. Shrinkage - Table 12-2:Muni LRV Models)	LZ	07/04/22	Add tare and crush-loaded weight to table	09/14/22	MJS	A	The weight scenarios AW0 (tare weight), AW1, (fully seated), AW2 (fully seated with moderate standing capatcity), and AW3 (crush load) will be provided under Table 12-2.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SF CTA agrees with suggest approach. Crush loaded weight must be used in design.	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC
TA.009	Section 12.2.1.1, Permanent Loads (First para after Table 12-2:Muni LRV Models)	LZ	07/04/22	Says use an LRV weight of 110,000 lbs, but does not say if that's the Breda or Siemens weight. Use the heavier.	09/14/22	MJS	A	Seimens S200 EMU tare weight is 76,000 (AW0), with seating for 60 people, total capacity of approx. 193 total passengers (assumes 6 people/m^2)	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SF CTA agrees with suggest approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC
TA.010	Section 12.2.2.4, Detailing (first bullet)	LZ	07/04/22	Specifies a maximum spacing of rebar but not a minimum. A minimum spacing should be specified to assure that the concrete aggregate can pass through.	09/02/22	NLV	B	Maximum spacing restricted beyond AASHTO LRFD Tunnels and ACI to control cracking. Minimum spacing as specified by AASHTO LRFD Tunnels and ACI are adequate; therefore, no additional requirement listed for minimum spacing.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.011	Section 12.2.2.4, Detailing (last bullet)	LZ	07/04/22	Need to specify the minimum wall thickness that the requirement of two layers of reinforcement applies to. Some walls may be of insufficient thickness to allow for concrete cover of rebar and appropriate spacing between the two layers of rebar.	09/02/22	NLV	B	Minimum wall thickness for two-layered walls will be defined by AASHTO LRFD Tunnels and ACI minimum spacing requirements. Minimum spacing as specified by AASHTO LRFD Tunnels and ACI are adequate; therefore, no additional requirement listed for wall thickness.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.012	Section 12.2.2.5, Joints (B. Construction Joints) (fifth sentence)	LZ	07/04/22	There are many types of waterstops, some more effective than others. Which types are recommended?	09/02/22	NLV	B	Waterstop requirements or definition are better suited to a Technical Requirements or Specifications document. Suggest to leave off Design Criteria, but include in Technical Requirements or Specifications.	10/05/22	LZ	During CRM with SF CTA on 10/5 - It was agreed that the waterstop type will be defined during the next phase of design in a technical specification/requirement.	10/05/22	MJS	The responder (PMPC Team) has agreed to define waterstop type and to develop requirements and specifications for waterstops. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
TA.013	Section 12.5, Bridges	LZ	07/04/22	Bridge criteria to be followed should include Caltrans	09/02/22	NLV	B	CBDS is already refereced in the current copy. Clarification may be needed for the comment.	10/05/22	LZ	During CRM with SF CTA on 10/5 - It was agreed that the intent of the comment was satisfied.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.014	Section 12.9, Watertightness and Leakage Mitigation	LZ	07/04/22	Although designing for watertightness, design should provide for collection and removal of any water infiltration due to failure of the waterproofing	10/01/22	MJS	A	Drainage and Plumbing system requirements in Chapter 16, Mechanical Systems is referenced and requires collection, conveyance, and removal of infiltrated water.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC
TA.015	Section 12.10, Drainage	LZ	07/04/22	Drainage system must be design to handle water infiltration over and above the allowable infiltration rates	10/01/22	MJS	A	Drainage and Plumbing system requirements in Chapter 16, Mechanical Systems is referenced and requires collection, conveyance, and removal of infiltrated water.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC

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GEC.001	Chapter 13 Scope, pg. 13-1	KC	12/10/21	Update the references for geotechnical parameters to latest geotechnical reports	05/02/22	DP	C	Geotech reports etc. are defined in Chapter 9, Geotechnical Requirements. Chapter 9 is referenced in the Scope section.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.002	Chapter 13 Codes, Standards and Guidelines, pg. 13-1	YS	12/10/21	Update for latest standards and add the following: American Concrete Institute (ACI). 2013. ACI 506.2 – Specification for Shotcrete. American Institute of Steel Construction (AISC). 2016. ANSI/AISC 360-16 – Specification for Structural Steel Buildings. ASTM International. ASTM A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.	05/02/22	DP	A	Agreed, ACI 506 is already included. Will add a generic reference to ASTM International. We're not going to list every applicable ASTM.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.003	Chapter 13 References, pg. 13-2	YS	12/10/21	Add the following: American Society of Civil Engineers. 2016. ASCE/SEI 7-16 – Minimum Design Loads for Buildings and Other Structures. The Concrete Society. 2007. Technical Report No. 63: Guidance for the Design of Steel-Fiber-Reinforced Concrete. John, Max, and Bruno Mattle. 2003. Shotcrete lining design: Factors of influence. In Proceedings of the Rapid Excavation and Tunneling Conference. 726–734. German Committee for Structural Concrete. 2015. DAfStb Guideline: Steel Fiber Reinforced Concrete. Bieniawski, Z.T. (1989). Engineering Rock Mass Classifications, New York: Wiley.	05/02/22	DP	A	Agreed, please note that the references list is not meant to be exhaustive or all-inclusive. The criteria states that 'appropriate' references may be used. This is left to the discretion of the EOR.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.004	Chapter 13 Section 13.1.1, pg. 13-2	YS	12/10/21	Add "Fiberglass dowels shall have a minimum tensile strength of 50 kips, conforming to ASTM D7205."	05/02/22	DP	A/B	See 13.1.3.4. Will modify strength from kips to an allowable stress to address different bar diameters.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	Chapter 13 Section 13.1.2, pg. 13-3	YS	12/10/21	Add "conforming to ASTM A615" behind "Lattice girders shall have a yield strength of 70ksi"	05/02/22	DP	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.006	Chapter 13 Section 13.2.5, pg. 13-4	YS	12/10/21	Clarify the loads for tunnel final lining associated with design fire event for tunnel fire-life safety	05/02/22	DP	A	The impacts on the lining need to be derived from ventilation analysis based upon the fire size and growth curve. This will show indicate the temperature growth in the lining versus time.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.007	Ch 13.1.3.4, Page 11-4 of 19	YS	04/08/22	Delete the word "face" as fiberglass dowels may also be used for temporary sidewall if a heading is divided into multiple drifts.	05/20/22	DP	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	Ch 13.1.6, Heading, Page 11-4 of 19	YS	04/08/22	Typo: Should be "Precast"	05/20/22	DP	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	Ch 13.5.3, 2nd Para., Page 11-13 of 19	YS	04/08/22	Suggest eliminating the use of shotcrete for tunnel final lining as it would create constructability issue associated with use of sheet waterproofing membrane.	05/20/22	DP	B	Understood, however there are areas where the use of shotcrete may be beneficial - such as the 2-3 track transition and within the adit, to offset unique formwork costs. Will leave as is.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	Ch 13.5.4, Page 11-13 of 19	YS	04/08/22	The concept of load sharing has been adopted by the industry. Elimination of this concept will result in over-design for the final lining and substantially increase the cost of construction. Suggest re-evaluating this requirement.	05/20022	DP	C	See response to comment HSR.018. This deserves further discussion. GEC should be prepared to provide examples of where load sharing has successfully been implemented (in CA, or similar seismic area); additional quality measures that would be implemented to ensure initial support shotcrete meets project design life requirements and how GEC intends to demonstrate that initial support retains its integrity after a maximum seismic event.	06/17/22	ROK	Comment Resolution Meeting (CRM) hosted by PMPC (Schreffler/Kaku) on 6/17/2022 with GEC/MJA (Y. Sun, K. Chohan, P. Chou, A. Beyabanaki, and R. Wong). The design team agrees with PMPC SME (D. Penrice) to not pursue load sharing at this point PENDING CHSRA Comment #HSR.029. Once the project delivery strategy is decided, this issue may be revisited. The design team will prepare a rough order of magnitude estimate of the difference in cost between currently-approved method and load-sharing method.	8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	Chapter 12	PC	09/12/16	LEGACY Comment GEC16.078 - Add a sub-section describing Design of Tunnel Portals requirements	05/02/22	DP	B	If the intent of section 11 is to cover cut and cover type structures then I would agree with it being covered there. In general other than the loads, load combinations the only thing specific to portals is the area required to prevent ear popping as the train transitions into the smaller space. In our case due to the speed going around the curve from 7th to Townsend, and the fact we have a station not far beyond the portal, the train will be at low enough speed that this shouldn't matter.	05/04/22	ROK	Understood. Also was thinking a performance requirement for type of joint (portal-to-trench, or portal-to-cut&cover), but also understand this can be decided by final designer. I assume we won't have a flood gate here, so I assume no design criteria is needed (if yes, then ROK).				05/04/22	CC
GEC.012	Chapter 12	PC	09/12/16	LEGACY Comment GEC16.079 - Add a sub-section describing Tunnel Waterproofing design requirements	05/02/22	DP	A	Agree with need for waterproofing/infiltration limits. The waterproofing will describe only where it's required. The majority of the requirements should be in the specifications.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.013	Section 12.8.1	PC	09/12/16	LEGACY Comment GEC16.080 - Need to make sure TJPA and JA (design team) agree with the load sharing concept, and if yes, the method to analyze load sharing.	05/02/22	DP	C	We had agreed the concept of load sharing between the initial support and final lining for SEM driven tunnels with JA. We can take another look at this based on the comment above if that's JA's current recommendation. Given the amount of temporary steelwork - rock bolts etc. that's within the temporary support it's hard to guarantee its durability for the design life of the project.	05/04/22	ROK					05/04/22	CC
GEC.014	Chapter 12	KA		LEGACY Comment GEC18.064 - There are no criteria for TBM or segmental liner design. Things like gasket requirements, segment reinforcing. Segments envisioned are not permanent elements but would need to be design as temporary support.	05/02/22	DP	A	Agree with comment, we should include requirements for segmental lining design if TBM driven tunnels are proposed. As suggested in the comment, if these are only for temporary purposes we wouldn't be overly prescriptive on gaskets and connectors.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.015	Sect. 12	YS		LEGACY Comment GEC18.065 - This section needs to include the requirements for the TBM tunnel design and construction.	05/02/22	DP	A	The preferred approach for Concept C Reduced "CRED" is a single-bore Sequential Excavation Methodology (SEM). TJPA/IPMT/ESC are working to approve. Suggest including requirements per GEC18.064 comment if this is appropriate.	05/04/22	ROK	No further comment.				05/04/22	CC

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GEC.016	Sect. 12	YS		LEGACY Comment GEC18.066 - The geotechnical design parameters were subsequently developed by JA in the Ground Characterization memo not the cited draft GIR.	05/02/22	MJS	A	The Scope section has been revised to include the following: •Final Geotechnical Interpretive Report, Part I, Soil and Rock Characterization for Mined Tunnel Design for the Caltrain Downtown Extension by Parsons Transportation Group, San Francisco, dated April 30, 2010 •Final Geotechnical Interpretive Report, Part II, Design Recommendations for the 30% Preliminary Engineering Design Phase of the Cut-and-Cover Segment of the DTX Alignment for the Caltrain Downtown Extension by Parsons Transportation Group, San Francisco, dated May 18, 2010 •Task 7.01, Ground Characterization Update – Preliminary Design Phase, Caltrain Downtown Extension, by Jacobs Associates, dated May 22, 2009 DP 05/25/22 - I don't see where these are included in the Scope section, nor on reflection do they need to be here. The reports should be referenced/listed in the Geotechnical chapter only. The reference we have to Chapter 9 within the Tunnels scope section is fine.	05/04/22	ROK	According to the current plan, the MJA's Ground Characterization TM will be included in the final GIR. Comment closed.				05/04/22	CC
GEC.017	DC 12. Scope	PC		LEGACY Comment GEC18.067 - Scope: change the references to geotechnical reports; maybe delete Arup and date?	05/02/22	MJS	A	The Scope section has been revised to include the most recent, Final GIRs. DP 05/25/22 - See my additional comment on the previous line. No sign of Geotech Report references in scope, which is fine, but responses should be updated.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.018	DC 12. Scope	PC		LEGACY Comment GEC18.068 - Codes, Standards and Guidelines: Add code references to precast concrete segment and steel fibers	05/02/22	DP	A	Agree with comment, we can add ACI references for segmental lining design and fiber reinforced segments.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.019	DC 12.1	PC		LEGACY Comment GEC18.069 - Add "Soil Reinforcement: fiberglass face dowels"	05/02/22	DP	C	Suggest we take another look at the requirements we've provided for what are essentially temporary support requirements, that may be better limited to specifications. If we want to keep such requirements in the design criteria then I agree with the comment.	05/04/22	ROK	Agree to use specification for non-critical temporary elements.				05/04/22	CC
GEC.020	Sect. 12.1.2	YS		LEGACY Comment GEC18.070 - Suggest including weld wire fabric, steel fiber, and macro synthetic fiber as part of initial shotcrete lining reinforcement materials.	05/02/22	DP	A	Agreed, design criteria to include weld wire fabric, steel fiber, and macro synthetic fiber as part of the initial shotcrete lining reinforcement materials.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.021	Sect. 12.2.3, Bullet c	YS		LEGACY Comment GEC18.071 - The ground loads for soft ground tunnels appear inconsistent. Should the ground arching be taken into account, the design would not consider the full overburden. Need clarification.	05/02/22	DP	A	Agreed. The requirements in this section appear empirical. We should modify and base ground loads from numerical modeling.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.022	Sect. 12.2.3, Bullet d	YS		LEGACY Comment GEC18.072 - Even for rock tunnels, the ground loads may depend on the rock quality. Specifying a ground load limit equal to 1 times the span for rock tunnels may or may not result in underestimating the ground loads. Suggest revising.	05/02/22	DP	A	Agreed, see GEC18.071 comment response.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.023	12.4 Table 12.2	KA		LEGACY Comment GEC18.073 - Tunnel distance to existing buildings is not meaningful. The as designed passes under existing buildings and the 10ft requirement is not possible to meet with a TBM option. I've seen requirements like this for buildings constructed after the tunnel is built. Suggest removing or modifying this requirement.	05/02/22	DP	A	Agreed. This has been removed.	05/04/22	ROK		05/09/22	DP	PMPC SME agrees with original comment, updated as noted - consider comment closed	05/09/22	CC
GEC.024	Sect. 12.5, Table 12.2	YS		LEGACY Comment GEC18.074 - The limits specified should be updated as some of them cannot be met due to the revised mining options in certain areas. By relaxing the limits, requirements for mitigation to limit the impact and potential damages to adjacent buildings or structures should be specified.	05/02/22	DP	A	Agreed. See response to GEC18.073. Table has been deleted.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.025	Table 12.2	DL		LEGACY Comment GEC18.075 - Suggest adding the word "foundation" at the end of the title for Table 12.2 so that it reads "Table 12.2, Clearance Requirements for Tunnel Relative to Existing Building Foundations."	05/02/22	MJS	A	Per previous comments, Table has been deleted.	05/04/22	ROK					05/04/22	CC
GEC.026	DC 12.5 & Table 12.2	PC		LEGACY Comment GEC18.076 - The minimum clearance needs to be revised. For example, TBM+SEM width along Townsend Street and near Fourth Street is about 71 to 75 ft or so, and vertical clearance is less than 20 to 25 ft and horizontal clearance at one corner (Safeway) is less than 5 ft (to pile foundations).	05/02/22	DP	A	Agreed. See response to GEC18.073/074. Table has been deleted.	05/04/22	ROK					05/04/22	CC
GEC.027	Sect. 12.7, 1st Paragraph	YS		LEGACY Comment GEC18.077 - Suggest including (1) macro synthetic fibers as reinforcement material for initial shotcrete lining, (2) face dowels if required, (3) pipe canopy as presupport, and (4) TBM segments as part of initial or temporary support for the mined tunnels.	05/02/22	DP	A	Agreed - will update section accordingly.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.028	Sect. 12.7.1	YS		LEGACY Comment GEC18.078 - Suggest adding a bullet about in situ stress conditions which are also critical in estimating the ground movements and ground loads.	05/02/22	DP	A	Agree with comment. Suggest we move away from providing load diagrams, this is also a bit empirical. We should be moving towards numerical modeling and defining the requirements of the modeling - to address the variations in stratigraphy and in situ conditions as suggested by GEC18.079.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.029	Sect. 12.7.2, Ground conditions	YS		LEGACY Comment GEC18.079 - Suggest adding a bullet under "ground conditions" about in situ stress conditions which are also critical in estimating the ground movements and ground loads. Also, indicate the importance of addressing the potential uncertainties in ground condition characterization by considering sensitivity analyses for variations of ground conditions along the alignment. These sensitivity analyses will be used for defining toolbox initial support measures.	05/02/22	DP	A	Agreed - added bullet. Requirements for sensitivity analysis are included in Section 12.4.1	05/04/22	ROK	No further comment.				05/04/22	CC

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GEC.030	Sect. 12.7.2, Construction parameters	YS		LEGACY Comment GEC18.080 - Suggest adding a bullet under "construction parameters: about need for pre-support or ground improvement.	05/02/22	MJS/DP	A	Modified second bullet to read as follows: "Need for face support, pre-support, or ground improvement measures" (DP) Agree with comment. I'd suggest the entire section needs a bit of a rethink. It's a bit out of date in comparison with say LA Metro or BART criteria.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.031	Sect. 12.7.2, Last paragraph	YS		LEGACY Comment GEC18.081 - Suggest also stressing the importance of controlling ground movements or surface settlements especially in the areas adjacent to existing structures.	05/02/22	MJS/DP	A	Please note that DTX Design Criteria Chapter 10 - Protection of Existing Infrastructure is also being updated. (DP) Agree with draft response. Added to bullet 3 of 2n bulleted list in 12.5.1. We can deal with ground movement/building settlement issues in Section 10.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.032	DC 12.7.2	PC		LEGACY Comment GEC18.082 - The analysis needs to include the languages to TBM liner.	05/02/22	DP	A	Agreed - will update section accordingly.	05/04/22	ROK					05/04/22	CC
GEC.033	Sect. 12.8	YS		LEGACY Comment GEC18.083 - Suggest indicating the tunnel is designed as undrained with watertightness requirement for the final lining.	05/02/22	DP	A	Agreed - infiltration criteria to be included as part of the waterproofing section.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.034	Sect. 12.8.1, 3rd bullet	YS		LEGACY Comment GEC18.084 - Suggest including steel ribs if used as part of initial support elements which should be excluded from the load sharing consideration.	05/02/22	DP	A	This section will be modified to not permit load sharing between initial support and final lining in design/analysis	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.035	Sect. 12.11, last sentence	YS		LEGACY Comment GEC18.085 - Do we permit any unsupported ground even though the tunnel stability would not be an issue? For workers' safety, we may require installation of a minimum support before any worker could go under. This may be addressed in Section 12.7.	05/02/22	DP	A	This is a specification issue, not really necessary for a DCM. However, added some text to 12.10 Cal/OSHA requirements	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.036	Sect. 12.14	YS		LEGACY Comment GEC18.086 - The following two items should also be addressed in the shaft excavation and support design: (1) Impact of the shaft excavation to adjacent structures if existing (2) Effect of breakout into an adit/crossover cavern from the shaft on the shaft support system	05/02/22	DP	A	(1) Would be addressed in Section 10 (2) Yes, agreed we should address that.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.037	Figure 12.1	YS		LEGACY Comment GEC18.087 - The lateral earth pressure Ph should be extended to the total height Ht of a tunnel.	05/02/22	DP	A	Agree with comment, but we should delete the figure. We should update the criteria to focus more on numerical modeling requirements.	05/04/22	ROK	No further comment.				05/04/22	CC
Cal.001	Chapter 13	BZ	04/21/22	include; AREMA	05/02/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Chapter 13 - 13.1.1	BZ	04/21/22	Concrete must conform to ACI 301 and ACI 304R. Concrete materials shall meet all applicable ASTM specifications.	05/02/22	DP	A	Will add ACI 301 reference. This is a design criteria, it's not intended to be a specification. These will be prepared separately. ASTM requirements are called out in individual sections as needed.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.003	Chapter 13 - 13.1.2	BZ	04/21/22	Shotcrete materials shall meet ASTM C1436.	05/02/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.004	Chapter 13 - 13.1.6	BZ	04/21/22	revise section title to 'Precast'	05/02/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.005	Chapter 13 - 13.1.6	BZ	04/21/22	provide AASHTO or ASTM gasket specifications	05/02/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.006	Chapter 13 - 13.2	BZ	04/21/22	revise font to lower case; revise sentence to clarify subsections.	05/02/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.007	Chapter 13 - 13.2.9	BZ	04/21/22	Protective measures must be approved by the TJPA and PCJPB.	05/02/22	DP	A	Ok, will add TJPA only since they will have contractual relationship with Contractor.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.008	Chapter 13 - 13.5	BZ	04/21/22	revise referenced section number to 12.4	05/03/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.009	Chapter 13 - 13.5.2	BZ	04/21/22	Geotechnical engineer to approve selected factors of safety.	05/03/22	DP	A	Text will be added per recommendation. DP 05/25/22: I can't find any reference to selected factors of safety in 13.5.2/12.5.2. Need to confirm where and what this is referring to.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.010	Chapter 13 - 13.6.1	BZ	04/21/22	'high strength cementitious grout'	05/03/22	DP	C	No, it's not. It can be as low as 150 psi or thereabouts.				8/5/2022	MJS	Caltrain did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.011	Chapter 13 - 13.8.4.2	BZ	04/21/22	omit 'used'	05/03/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.012	Chapter 13 - 13.9.2	BZ	04/21/22	omit additional text spaces	05/03/22	DP	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.013	Chapter 12	BZ	10/18/18	LEGACY Comment Cal18.037 - Chapter 12 Tunnels (general) Any design guideline/criteria for tunnel waterproofing?	05/02/22	DP	A	Basic requirements for the waterproofing extent will be added in section 12.1.5, per response to GEC16.079. Infiltration limits are included as 12.9. Waterproofing material requirements will be within specifications.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.014	Section 12.7.2	BZ	10/18/18	LEGACY Comment Cal18.038 - Section 12.7.2 Analysis (Construction Parameters: bullet eight - "Waterproofing between initial support and final lining" Any design guideline/criteria for tunnel waterproofing?	05/02/22	DP	A	To be added in section 12.1.5 and 12.9, per response to GEC16.079.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.015	Chapter 13 Section 13.5.4; (Page 13-14 of 20)	JP	06/30/22	Load sharing between the temporary construction support and the final lining of the mined tunnel shall be justified by analysis and approved by TJPA prior to NTP for final design. (reference MINED Tunnel Design Preliminary Engineering Technical Memorandum 334.1.1)	08/19/22	DP	C	Please refer to comment GEC.010 above, and the resolution with the GEC. There is no way the integrity of the initial support can be verified after the maximum seismic event.				10/04/22	MJS	See response to comment GEC.010 above. We met with the GEC to discuss load sharing, with the intent of determining how we can verify the integrity of the initial support after a maximum seismic event, which it is not designed to withstand, and trying to understand the cost implications of the criteria. Per that comment we may revisit this issue later. As stated, this could also be proposed as a VE savings though that too would need to address post-seismic event support integrity. The responder (PMPC Team) has agreed to investigate load sharing concepts during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 99
Comments Closed 99
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 13, Tunnels*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Kush Chohan (Design Team/McMillan Jacobs Ass.)	CK	Y. Sun (Design Team/McMillan Jacobs Ass.)	YS
Peter Chou (Design Team/Parsons)	PC	Danny Lin (Design Team/Parsons)	DL
Bin Zhang (Caltrain)	BZ	Joel Pancoast (Caltrain)	JP
Eric Abrahamson (CHSRA)	EA	Elena Lasheras (CHSRA)	EL
S. Klein (CHSRA)	SK	Luis Zurinaga (SF CTA)	LZ
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Derek Penrice (PMPC SME/Mott MacDonald)	DP
Matt Schreffler (PMPC/Mott MacDonald)	MJS		

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C – Answer provided; no action needed
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ROK – response okay
BCC – Back-check comment
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.001	Section 13.1, p. 2	SK	03/28/22	Suggest deleting "temporary" and reword to say "used for initial support and final lining of tunnel excavations".	05/03/22	DP	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.002	Section 13.1.1, p. 3	SK	03/28/22	Refer to ACI 318 and other pertinent ACI references for other requirements like aggregates, admixtures, etc.	05/03/22	DP	A	Ok, added specific reference to ACI 301.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.003	Section 13.1.6, p. 4	SK	03/28/22	First word in title is misspelled, the "P" in precast is missing.	05/03/22	DP	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.004	Section 13.1.6, p. 5	SK	03/28/22	Gasket material specifications should be provided like ASTM C920, ASTM D412, etc.	05/03/22	DP	B	Our intent isn't to provide a list of ASTM'S within the DCM. They can be addressed within specs. ASTM C920 relates to poured joint sealant, is that a typo?	06/21/22	BCC	Response not acceptable. In Section 13.1.4.2, two paragraphs above, two ASTM sections are listed for lattice girders (A615 and A36) and these are for initial support only. The gaskets have several very general requirements aimed at ensuring adequate gasket performance for design life. For consistency, provide applicable ASTM references to achieve gasket durability for 100 year design life.	08/19/22	DP	Revised the first sentence of Section 13.6.1: "Precast tunnel lining segments must include perimeter gaskets conforming with ASTM C920 and D412 to prevent waterflow through joints." The responder (PMPC Team) agreed to update per backcheckcomment response; therefore this comment is considered closed.	10/12/22	CC
HSR.005	Section 13.2, p. 5	SK	03/28/22	First sentence needs to be corrected. AASHTO LRFD Tunnel spells out load combinations that should be considered. Second paragraph is too vague. Unless the load combinations are provided herein, revise to specifically refer to AASHTO LRFD Tunnel for requirements.	05/03/22	DP	A	Will clarify. Intent is that AASHTO load combinations are adopted. Second paragraph relates to permanent loads, the title of which is caught up in the first paragraph.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.006	Section 13.2.1, p. 5	SK	03/28/22	Dead loads should also include the weight of elements attached to the final lining such as the OCS system, communications, pipes, etc.	05/03/22	DP	A	Agreed, these are defined in 13.2.1 as superimposed dead loads. Will clarify.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.007	Section 13.2.3. p. 5	SK	03/28/22	Shouldn't design ground loads be given in the Geotechnical Baseline Report (GBR). There should be an interpretive geotechnical report that defines the ground loads and groundwater pressures for design.	05/03/22	DP	C	Ground loads will not be provided in the GBR. For a DB or other alternative procurement, these will be developed by the Geotechnical Engineer of Record. Parameters used as part of the Preliminary Engineering can be provided as a reference document.	06/21/22	BCC	Do not agree that it should be up to Geotechnical Engineer of Record to determine design ground loads. The Owner has a vested interest in making sure that lining is designed properly. GBR should indicate minimum design ground loads that must be complied with.	08/19/22	DP	There are many examples of GBR's without minimum design ground loads - LA Metro Measure R Projects, Sound Transit East Link, Northgate Link, U-Link, BART Silicon Valley Extension just to name a few. With the exceptioon of BSVII, these projects have been constructed, with proper lining design. There is significant opportunity for design parameters developed by the Geotechnical EOR to be reviewed for their appropriatenesss. The responder (PMPC Team) will investigate the merits of including minimum design ground loads as a requirement for the GBR during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
HSR.008	Section 13.2.3. p. 6	SK	03/28/22	Under d., design rock loads should also consider the weight of unstable rock blocks and wedges daylighted by the tunnel excavation. These blocks/wedges may be point loads on the lining and may be eccentric loads.	05/03/22	DP	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.009	Section 13.2.3. p. 6	SK	03/28/22	Under g., ground-structure interaction models do not determine the loads acting on tunnel linings but they can be used to evaluate the lining stresses for a certain tunnel geometry, ground condition (including the physical properties associated with these conditions), and groundwater regime.	05/03/22	DP	A	Will remove references to ground loads.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.010	Section 13.2.11, p. 7	SK	03/28/22	Does the "Threat and Vulnerability Assessment" provide blast loading criteria? Specific blast loading criteria should be provided if this loading is to be considered in tunnel design.	05/03/22	DP	B	It is the intent that blast requirements will be presented within the T&VA. This will be a security sensitive document. The criteria will not be included in the DCM.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.011	Section 13.2.13, p. 8	SK	03/29/22	Segmental linings should also be designed for construction loads due to handling, stacking, transporting, lining erection, and TBM advancement (thrust jack loads).	05/03/22	DP	A	They are all construction loads, and there is a requirement that the lining accommodate construction loads per 12.2.8. The load conditions described are also explicitly addressed within AASHTO. However, will add, as clarification.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.012	Section 13.4, p. 8	SK	03/29/22	Should identify load combinations from AASHTO LRFD Tunnel that need to be considered. Evaluate if there are other load combinations that must be addressed.	05/03/22	DP	A	All of them, this is implicit by the use of the code. Will clarify.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.013	Section 13.4.1, p. 9	SK	03/29/22	In last paragraph, delete "comparison… comparable projects". Such a comparison is not a valid approach to checking modeling results for DTX project. There could be an error with inputs that would not be picked up.	05/03/22	DP	C	The comparison is valid. For similarly sized excavations in similar ground conditions - if the results are significantly different, then further investigation may be required (of both projects), which isn't a bad thing. It's not the intended to represent the primary method of design checking. Have modified text to reflect that this can only supplement alternative analysis methods.				8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.014	13.5.1, p. 11	SK	03/29/22	In second group of bullets, modify third bullet to say "ensure stability and control ground movements at each stage".	05/03/22	DP	A	Ok, will add.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.015	13.5.1, p. 11	SK	03/29/22	In last paragraph, revise "and load combinations comparable to those applied for the final lining". Some load combinations applied to final lining involve long-term operations (i.e. fire, blast loading, etc.) which would not be relevant load combinations for the initial support system by itself. Better to identify specific load combinations for design of initial support systems.	05/03/22	DP	A	Will review the wording. Note that the first sentence uses 'applicable' before load combinations, and the second sentence defines that extreme loads - which includes fire and blast in the AASHTO, need not be applied, with the exception of seismic.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.016	13.5.2, p. 13	SK	03/29/22	In the second bulleted list and second to last paragraph, the term "outer lining" is used. Does this refer to initial support or final lining? Please clarify.	05/03/22	DP	A	13.5.2 relates to initial support. Will replace 'outer lining' with 'initial support'.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.017	13.5.3, p. 13	SK	03/30/22	Refer to ACI 544.7R for design of fiber reinforced tunnel segments.	05/03/22	DP	A	Noted. This is listed in the standards at the start of the section. Section 12.5.3 is exclusive to final lings of mined tunnels. Also note that per 12.6.1, segments reinforced with fiber only are not currently permitted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 99
Comments Closed 99
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 13, Tunnels*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Kush Chohan (Design Team/McMillan Jacobs Ass.)	CK	Y. Sun (Design Team/McMillan Jacobs Ass.)	YS
Peter Chou (Design Team/Parsons)	PC	Danny Lin (Design Team/Parsons)	DL
Bin Zhang (Caltrain)	BZ	Joel Pancoast (Caltrain)	JP
Eric Abrahamson (CHSRA)	EA	Elena Lasheras (CHSRA)	EL
S. Klein (CHSRA)	SK	Luis Zurinaga (SF CTA)	LZ
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Derek Penrice (PMPC SME/Mott MacDonald)	DP
Matt Schreffler (PMPC/Mott MacDonald)	MJS		

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.018	13.5.4, p. 13	SK	03/30/22	Neglecting load sharing for a SEM tunnel is very conservative. Typically for a tunnel this size, the thickness of the initial support shotcrete will be significant and some of it should be effective for long-term ground support. This requirement should be re-evaluated.	05/03/22	DP	C	The previous version of the DTX Criteria did allow load sharing between the initial support and final lining. Ultimately omitting the load share component is not that conservative. The initial support is penetrated regularly by spiles and other temporary steelwork. It is not designed for the ODE or MDE events. Ensuring it's durability for the 100 year project design life or its integrity after an ODE/MDE event is questionable. The quality of initial lining shotcrete installation would also need to improve significantly prior to accepting this condition - which would necessitate more rigorous quality assurance and control during construction, at a cost premium. Load sharing was not permitted for Chinatown Station, nor for the Regional Connector Cavern, nor for the Sound Transit Bellevue Tunnel. Caltrans Devils Slide tunnels assume deterioration of the initial support and that all loads be supported by the final lining. At this scale the arch final lining is typically thicker than would be required for strength design alone, to accommodate placement of concrete. The cost implications from ignoring a contribution of the initial support are not that great.	06/21/22	BCC	It seems like load sharing with the intial support system could be utilized to safely achieve some cost savings. It is noted that the final lining is 18 to 21 inches thick and reinforced with steel rebar mats on each face. This lining thickness is more than enough for constructability. The initial shotcrete layers may be subject to long-term degradation but subsequent layers would be protected and would not be penetrated by spiling or other rock reinforcement. This is something that may be of interest from a value engineering standpoint.	08/19/22	DP	See response to comment GEC.010 above. We met with the GEC to discuss load sharing, with the intent of determining how we can verify the integrity of the initial support after a maximum seismic event, which it is not designed to withstand, and trying to understand the cost implications of the criteria. Per that comment we may revisit this issue later. As stated, this could also be proposed as a VE savings though that too would need to address post-seismic event support integrity. The responder (PMPC Team) has agreed to investigate load sharing concepts during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
HSR.019	13.6.3, p. 14	SK	04/01/22	For joint design, reference ACI 533 and PAS 8810:2016 "Tunnel Design-Design of Concrete Segmental Linings-Code of Practice", British Tunneling Society.	05/03/22	DP	A	ACI 533 is listed as a reference standard at the start of the Section. Will add PAS as reference document.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.020	13.7, p. 15	SK	04/01/22	First paragraph refers to the "Geotechnical Interpretive Report". What about the Geotechnical Baseline Report? Will a GBR be prepared?	05/03/22	DP	A	There will be a GBR. Text modified to remove reference to the GIR and to state that recommendations are to be provided by the EOR.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.021	13.8.3, p. 16	SK	04/01/22	Second paragraph indicates rebar spacing must not exceed 12 inches or 1.5 times the lining thickness. Add ", whichever is less" to this sentence.	05/03/22	DP	A	Ok.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.022	13.8.4.1, p. 16	SK	04/01/22	How much movement does an interface joint have to be designed for? Chapter 10 mentions some dynamic modeling but it is not clear how this should be done.	05/03/22	DP	A	Will clarify. I don't believe the GEC has performed any analysis that would indicate the magnitude of the joint movement, however, based on work done elsewhere in the Bay Area the calculated movement will likely be in the range of a couple of inches. Will clarify that the design joint movement needs to be that calculated from numerical modeling, plus an increment/factor.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.023	13.9, p. 17	SK	04/01/22	The first sentence indicates groundwater inflows are to be minimized by the use of "relatively impervious shotcrete linings". Why not rely on waterproof membranes? This is a much more positive way to avoid groundwater inflows. How about where precast concrete segmental linings are used? Please revise.	05/03/22	DP	A	The first sentence clearly states 'during construction'. Para 3 starts to discuss the use of membrane for the completed tunnel. Will try and clarify requirements for mined tunnels versus bored, though requirements for bored tunnels are in 12.9.2.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.024	13.9, p. 17	SK	04/01/22	Considering some of the impacts of dewatering at the transit center, why would TJPA allow leakage into the tunnel at all? This section is redundant, poorly organized, and confusing. The objective should be a watertight tunnel which is not clear the way this is written.	05/03/22	DP	A	Will clarify language. The statement re-dewatering impacts at the Transit Center is not clear - how does dewatering or pumping hundreds/thousands of gpm compare with infiltration in the amount of a few gpd? DTX does require a waterproofing membrane, or equivalent. Despite these, infiltration will still occur, hence the additional/allowable criteria is prudent. The infiltration criteria provided are quite onerous and should not impact system durability. Zero infiltration is not realistically achievable.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.025	13.1.1	EA	04/19/22	Cast-in-place concrete requirements for CHSR are different, requiring 4000 to 5000 psi depending on application. Refer to CHSR criteria for details.	05/03/22	DP	C	The objective for DTX is that the structures provided be durable for 100 years. I'm not sure that there is a requirement that the DTX and CHST criteria have identical requirements. We have specified 4,000psi as a minimum for cast in place concrete. The designer may elect to use 5,000 psi concrete if they choose.	06/23/22	ROK	Ok, I was only pointing out the difference between CHSR & DTX criteria.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.026	13.1.2	EA	04/19/22	CHSR design criteria specifies that steel fibers be excluded from 1 inch of shoterete cover where adjacent to waterproof membranes.	05/03/22	DP	B	Ok. This is not necessarily consider that a 'design criteria' as opposed to a performance requirement that'd be addressed within the technical specifications. CHSRA is requiring an unreinforced or smoothing shoterete layer which is fairly typical.	06/23/22	ROK	Ok, I was only pointing out the difference between CHSR & DTX criteria.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.027	13.1.3.4	EA	04/19/22	Fiberglass dowel strength is specified to be 50 kips. CHSR design criteria specifies the strength as 70 ksi. So, so sqrt(4*50/70/pi) = 0.95", so is the assumed dowel diameter 1" ? Dowel strength varies with diameter.	05/03/22	DP	A	We appreciate the strength varies with diameter. Will modify requirement to 70ksi.	06/23/22	ROK	Agree.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.028	13.2.10, 13.2.3 i	EA	04/19/22	Flood return period not specified in 12.2.10. 12.2.3 i says to design for temporary load conditions, including the 100-year flood. CHSR design criteria specifies design for 500-year flood.	05/03/22	DP	C	Flood elevations are defined in Section 04 - Environmental Requirements. There's no need to repeat these here.	06/23/22	ROK	Ok, I didn't have Chapter 4 @ time of original review.	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.029	13.5.4	EA	04/19/22	"Load sharing between initial support and the final lining is not permitted" This conflicts with Section 12.5.3 next to last paragraph "final linings must consider a condition whereby the ground load is taken by the initial support but the groundwater load is acting upon the tunnel" If the initial lining carries soil load while the final lining carries groundwater pressure, that's load sharing. Recommend brief explanation why provision of 12.5.4 needed ? CHSR allows load sharing, with up to 35% of soil load carried by the initial lining, and 100% of groundwater pressure on the final lining.	05/03/22	DP	DE	It is not a conflict. There is a reasonable expectation that the initial support will degrade over time. However, when first installed there is a reasonable expectation that the initial support will continue to support ground loads. The initial support is not designed for hydrostatic pressures, which are assumed to be supported by the final lining. This is a condition that can result in different effects on the final lining than the assumption that the lining carries all ground/water loads and cannot be ignored. See response to HSR.018. The requirements in the CHST Criteria are similar to those that were in the DTX Criteria in 2009. We'v since realized through practical application, that the load share concept in practice is not straightforward.	06/23/22	ROK	Comment no longer applies. In June 1, 2022 Section 13.5.4 states "Load sharing between the initial support and the final lining is not permitted."	8/5/2022	MJS	CHSRA did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**99**
Comments Closed	**99**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 13, Tunnels*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Kush Chohan (Design Team/McMillan Jacobs Ass.)	CK	Y. Sun (Design Team/McMillan Jacobs Ass.)	YS
Peter Chou (Design Team/Parsons)	PC	Danny Lin (Design Team/Parsons)	DL
Bin Zhang (Caltrain)	BZ	Joel Pancoast (Caltrain)	JP
Eric Abrahamson (CHSRA)	EA	Elena Lasheras (CHSRA)	EL
S. Klein (CHSRA)	SK	Luis Zurinaga (SF CTA)	LZ
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Derek Penrice (PMPC SME/Mott MacDonald)	DP
Matt Schreffler (PMPC/Mott MacDonald)	MJS		

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment
PAR - Parsons to discuss internally

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.030	13.2.10	EL	04/19/22	No design requirements found in this chapter related to Base Flood Elevations. Critical facilities for CHSR, such as tunnel portal sites and facilities, and vent structures shall be designed so that the finish floor elevation or top of slab foundation of these facilities are a minimum of 2 feet above 100-year floodplain or six inches above 500-year floodplain, whichever is greater.	05/03/22	DP	C	Flood elevations should/will be defined in Section 04 - Environmental Requirements. There's no need to repeat these here. We agree with the need to define freeboard requirements at portals and other penetrations into the tunnel, but these are not requirements of stations and cut and cover structures, not the mined tunnel.	06/24/22	BCC	Chapter 04 (Environmental requirements) was not provided originally to CHSRA for review. Chapter 4 in the DTX design Criteria Manual Rev Book 02 Draft Final document refers to chapter 5 (Civil Design) for requirements related to flooding. And the requirements included in chapter 5 do not comply with CHSRA requirements indicated in the original review comment. Please revise to incorporate the following: Critical facilities, such as tunnel portal sites and facilities, and vent structures shall be designed so that the finish floor elevation or top of slab foundation of these facilities are a minimum of 2 feet above 100-year floodplain or six inches above 500-year floodplain, whichever is greater.	10/19/2022	MJS	The responder (PMPC Team) recognizes that critical facilites must be designed for flood mitigation. Revisions have been made to address this issue in the relevant chapter/section; therefore this comment is considered closed. Section "4.5 Sea Level Rise and Floods" has been revised as follows: The project's critical flood inundation elevation of +13.32 feet (NAVD88) factors in sea-level rise over the 100-year life cycle of the project or 2 feet above the 100-year floodplain elevation, whichever is greater Critical facilities, such as the tunnel portal and vent structures, must be designed so that the finish floor elevation or top-of-slab foundation are compliant with the criteria. Where this is not feasible, reasonable flood mitigations must be implemented. As approved by TJPA. Where portions of the project are within the 100-year floodplain or may be affected by other portions of the project within the 100-year flood plain, the drainage facilities must be designed for the 100-year flood condition."	10/19/2022	CC
HSR.031	13 (whole chapter)	EA	06/23/22	The structures chapter was changed from chapter 11 to chapter 12. There are many references to chapter 11 sections which should be chapter 12 sections.	08/19/22	DP	A	Editorial – PMPC Team to update.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.032	13 (whole chapter)	EA	06/23/22	The seismic chapter was changed from chapter 13 to chapter 10. There are many references to chapter 13 sections which should be chapter 10 sections.	08/19/22	DP	A	Editorial – PMPC Team to update.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.033	13 (whole chapter)	EA	06/23/22	The tunnel chapter was changed from chapter 12 to chapter 13. There are many references to chapter 12 sections which should be chapter 13 sections.	08/19/22	DP	A	Editorial – PMPC Team to update.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.034	13.2.8 third bullet	EA	06/23/22	"Retrieving data. Wait a few seconds and try to cut or copy again." Maybe this should be deleted.	08/19/22	DP	A	Editorial – PMPC Team to update.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.035	13.4.2, last paragraph	EA	06/23/22	"The final lining system of the tunnel must be designed with sufficient ductility and strength to withstand the ground deformations imposed on the tunnel by ground shaking and as required in Chapter 2, Owner's Requirements." Chapter 2 has no ground shaking requirements.	08/19/22	DP	A	Agreed. I believe the ODE/MDE used to be defined there. Text is actually repeated earlier in the tunnels section, will delete text in 13.4.2. All references will be to Section 10 - Seismic.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.001	Chapter 13, Scope (first sentence)	LZ	07/04/22	TBMs are no longer being considered for the project	08/19/22	DP	A	Agreed. TBM related criteria can be deleted, or retained if the same Criteria may ultimately be used for PAX.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.002	Section 13.1.1 (second para, second bullet)	LZ	07/04/22	From the tunnels submittal, it appears that there will not be precast tunnel lining in the tunnel	08/19/22	DP	A	Agreed, it's primarily used in conjunction with TBM driven tunnels. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.003	Section 13.1.5	LZ	07/04/22	Should add: however, a drainage system will be provided to collect and remove water infiltration resulting from waterproofing failure	08/19/22	DP	A	Agreed. Will expand section on drainage beneath Table 13-1 to state this per TA.012.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.004	Section 13.1.6	LZ	07/04/22	No precast tunnel segments . This whole section is for TBM	08/19/22	DP	A	Agreed. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.005	Section 13.2.7.2	LZ	07/04/22	The requirement that the design must not result in collapse may be in conflict with the requirement above that the lining have a 2-hr fire rating	08/19/22	DP	A	Agreed. Deleted the fire-rating.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.006	Section 13.4.2	LZ	07/04/22	Reference to bored tunnel	08/19/22	DP	A	Agreed. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.007	Section 13.4.2 (last para)	LZ	07/04/22	Reference to chapter 13 should be reference to Chapter 10	08/19/22	DP	A	Editorial – PMPC Team to update.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.008	Section 13.6, Bored Tunnel Lining Design	LZ	07/04/22	Section on TBM - not needed	08/19/22	DP	A	Agreed. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.009	Section 13.9.2, Bored Tunnels	LZ	07/04/22	Relates to TBM	08/19/22	DP	A	Agreed. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.010	Section 13.9.2, Bored Tunnels	LZ	07/04/22	Add "The design will also provide for drainage and removal of water infiltration for the life of the project	08/19/22	DP	A	Agreed. Will expand section on drainage beneath Table 13-1 to state this per TA.012. This applies to all tunnel types.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.011	Section 13.9.2, Bored Tunnels	LZ	07/04/22	TBM	08/19/22	DP	A	Agreed. See response to TA.001.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.012	Section 13.9.3, Drainage	LZ	07/04/22	Expand this section for the provision of a drainage system that will collect and remove water infiltration resulting from waterproofing failure	08/19/22	DP	A	Agreed, will add.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 131
Comments Closed 131
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 14, Architecture*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
Randy Volenec (Design Team/PC Parch)	RV	John Bumanis (Design Team/Parsons)	JB
Robin Chiang (Design Team/Robin Chiang & Co.)	RCCo	David Fun (Design Team/Robin Chiang & Co.)	DF
AB (Caltrain)	AB	Bin Zhang (Caltrain)	BZ
James Deane (CHSRA)	JRD	Paul Hebditch (CHSRA/HNTB)	PH
M. Brunner (CHSRA)	MBr	X. Banko (CHSRA)	XB
Luis Zurinaga (SF CTA)	LZ	Heather Kim (Design Team/PCPA)	HK
Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Osborne Anthony (PMPC SME/AECOM)	OA

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	Ch. 14, General	RV	04/08/22	General note: Please confirm that all space descriptions align with the previously provided program spreadsheets Per Chapter 1 comment GEC.006 - Add Wayfinding signage to chapter 14 Architecture.	05/19/22	AK	A	Will confirm and update				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	14.1.3.1.e.	RV	04/08/22	Suggest eliminating "have canopies" from sentence as it is too restrictive.	05/19/22	OA	B	Canopies are used to protect stairs and escalators from the elements as a safety measure and to minimize maintenance. Removing them is not recommended.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	14.1.3.2.c - Design of concourse and lower concourse	RV	04/08/22	Suggest adding note "wherever possible without major modification to existing building structure or equipment."	05/19/22	OA	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	14.1.3.2.d - Design of concourse and lower concourse	RV	04/08/22	Suggest similar note as above (comment #3)	05/19/22	OA	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	14.1.3.2 - Public Restrooms, third bullet	RV	04/08/22	Replace "wall partition or wall hang partition" with "stall, door, and privacy latches"	05/20/22	OA	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	14.1.3.3 - Platform level features, first bullet	RV	04/08/22	Please indicate number of benches required per platform	05/26/22	OA	DE	Seating quantities and provisions requires an evaluation of ridership and the level of service anticipated as well as pedestrian flow analysis.	08/05/22	BCC	See new additional comment (#GEC.041) in latest CRL spreadsheet.	9/22/2022	MJS	Please see responses to new comments GEC.041, below	9/22/2022	CC
GEC.007	14.1.3.3 - Platform level features, seventh bullet	RV	04/08/22	Revise to read as "Unter-platform access, where feasible, understanding Caltrain platforms are 8" above top of rail"	05/19/22	AK	A	Will comply.	08/05/22	BCC	Caltrain has revised their platform height to 21.7" above top of rail at the transit center. So it might be better to revise to read as "under-platform access, where feasible."	9/27/2022	MJS	Revised as noted	9/27/2022	CC
GEC.008	14.3.1.2 - Platform Level	RV	04/08/22	Suggest less prescriptive dimensions for platforms as Caltrain and CHSRA guidelines and variances are evolving.	05/19/22	AK	B	The platform dimensions should reflect what is currently agreed upon with the operators.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	14.4.6 - Materials and Finishes, ¶3 First bullet	RV	04/08/22	Revise to read as " Metal panels should be designed to reduce the visual impact of scratches."	05/19/22	AK	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	14.4.6 - Materials and Finishes, ¶3 Second bullet	RV	04/08/22	Remove "be textured" from first sentence.	05/19/22	AK	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	14.4.6.6 - Reflectance, ¶1-2	RV	04/08/22	Suggest a less restrictive description "bright and light-colored" to allow flexibility in the design aesthetic.	05/19/22	OA	B	This description ensures visual quality that contributes to the passenger experience. It is not a major cost driver.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.012	14.6.1 - Stairs, ¶2	RV	04/08/22	Note: Train box floor-to-floor levels all exceed 20' and stairs are used throughout.	05/19/22	OA	DE	While criteria is defined for stairs, specific station configuration evaluation determines final stair layout. The Fourth and Townsend St. Station is also included in this criteria.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.013	14.6.1.2 - Width, ¶1-2	RV	04/08/22	Revise second sentence to read as follows: The minimum stair width is 5 feet, unless precluded by existing building structure."	05/19/22	OA	DE	Suggested width reduction needs to be checked and confirmed with overall egress requirements.	08/05/22	BCC	Since some stairs at the Transit Center are provided with bike channels to ease access down and up from Platform level, it will be difficult to meet the minimum stair width of 5ft requirement without impacting the existing building structure.	9/22/2022	OA	Revised as follows: "Stair widths must be based on anticipated levels of service. The minimum stair width is 5 feet, unless precluded by existing building structure. If 5 feet stair width cannot be achieved, any variance must be approved by TJPA." The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/11/22	CC
GEC.014	14.6.1.3 - Headroom, ¶1-1	RV	04/08/22	Revise sentence to read as follows: "… must be maintained, unless precluded by existing building structure at which point code required minimum clear headroom will be utilized."	05/19/22	OA	A	Will comply.	08/05/22	BCC	This recommended language was not included in the new draft. At the Transit Center, the as-built condition might preclude the ability to provide a minimum 9ft clear in certain locations.	9/22/2022	OA	Revised as follows: "A minimum clear headroom of 9 feet, measured perpendicular from the line of the tread nosing to the underside of the ceiling, must be maintained, unless precluded by existing building structure. If 9 feet clear headroom cannot be achieved, any variance must be approved by TJPA." The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/11/22	CC
GEC.015	14.6.1.5 - Guardrails and Handrails, ¶1-2	RV	04/08/22	Revise second sentence to read as follows: "If glass is used, it must be laminated and tempered, to meet RVA blast requirements."	05/19/22	OA	A	Will comply.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.016	14.6.3 - Escalators, ¶1-1	RV	04/08/22	Revise first sentence to read as follows: ".. Exceeds 12 feet, except where stairs are required, in lieu of escalators, to meet projected passenger loads."	05/19/22	OA	A	Will comply.	08/05/22	BCC	This recommended language was not included in the new draft. At the Transit Center, probably mode of vertical circulation are stairs due to the projected passenger loads and as-built conditions.	9/22/2022	OA	Revise per original comment	9/27/2022	CC
GEC.017	14.6.3.1 - Space Requirements (Queuing and Run-off Space), ¶1	RV	04/08/22	Note: In Phase 1, the provided queuing and run-off spaces were 16', which were determined to be adequate for the passenger loading.	05/19/22	OA	DE	Suggested queuing needs to be checked and confirmed with overall level of service requirements.				05/20/22	MM	Comment response is satisfactory to TJPA.	05/20/22	CC
GEC.018	14.6.3.2 - Design Features, ¶1-1	RV	04/08/22	Revise first sentence to read as follows: "Escalators must be heavy-duty, commercial grade with the following design features:"	05/19/22	OA	C	A reference has been added to the APTA Heavy Duty guidelines. Escalator equipment should reflect a level of performance commensurate with utilization appropriate for a transit system.	08/05/22	BCC	Per TJPA direction, heavy-duty commercial grade escalators were provided in Phase 1 of the Transit Center and the same type was requested for Phase 2. The criteria still reads "transit-grade".	9/22/2022	OA	Revise per original comment (carry forwrad Phase 1 standard)	9/27/2022	CC
GEC.019	14.6.3.2 - Design Features	RV	04/08/22	Note: HD commercial grade were used in Phase 1 due to initial costs and maintenance costs with little perceived benefit by using transit-grade equipment.	05/19/22	OA	DE	The suggested reduction selection requires evaluation and confirmation that long term performance and maintenance benefits are not minimized with use of commercial equipment. A variance may be requested by the design team, if needed.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 131
Comments Closed 131
% Complete 100%

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Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
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Document date:	*2/28/2022*		

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GEC.020	14.6.3.6 - Location (Safety), ¶1-1	RV	04/08/22	TJPA operational issue at East Beale Pavilion.	05/20/22	OA	A	Under Safety heading, a sentence will be added that notes the below are "where feasible."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.021	14.6.3.7 - Design Features, ¶1-1	RV	04/08/22	Note: Similar to escalators, I believe we used HD commercial elevators in Phase 1. I need to confirm this and a few other items with our VT consultant, but will follow up on Escalators and Elevators as soon as I have information.	05/20/22	OA	DE	The suggested reduction selection requires evaluation and confirmation that long term performance and maintenance benefits are not minimized with use of commercial equipment. A variance may be requested by the design team, if needed.	08/05/22	BCC	It is confirmed that HD commercial grade elevators were installed in Phase 1 per TJPA direction. HD commercial grade elevators were directed by TJPA to be specified for Phase 2 scope as well.	9/22/2022	OA	Section 14.6.4.3 "Design Features" has been updated to state the following: "Elevators must be heavy-duty transitcommercial-grade as follows: "	10/10/22	CC
GEC.022	14.6.3.7 - Design Features (Freight Elevators), Third bullet	RV	04/08/22	Note: Loading Dock Phase 1 Freight elevator is 10,000# capacity, second shaft is constructed for second 10,000 LD elevator	05/20/22	OA	A	Will update criteria accordingly.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.023	Chapter 20	AB	09/12/16	LEGACY Comment GEC16.087 - Per the terms of NTP#9, the conceptual design of BART/MUNI pedestrian connector is now considered part of the scope of the DTX project. This Chapter does not comprise any design criteria for the BART/MUNI Pedestrian Connector component.	02/28/22	AK	C	As of September 2021, the BART/Muni Pedestrian Connector has been officially deferred from the DTX project.	05/04/22	ROK	No further comment.				05/04/22	CC
GEC.024	Section 20.1	RCCo	09/12/16	LEGACY Comment GEC16.088 - Request confirmation extent of 'integration' between the existing 4th & Townsend Surface Station with the new UG Station to avoid unnecessary redundancy – update accordingly.	02/28/22	MM	C	For this revision of the design criteria, no further information is available from Caltrain and/or Prologis regarding integration. The design criteria is a living document and will be updated accordingly as plans for the Fourth and King Railyard mature.	05/04/22	ROK					05/04/22	CC
GEC.025	Section 20.1.1	RCCo	09/12/16	LEGACY Comment GEC16.089 - Request confirmation of Station Planning requirements for the new 4th & Townsend UG Station - update accordingly.	02/28/22	MM	C	Programmatic space planning requirements have been provided by Caltrain and CHSRA. It is not the intention of PMPC to include the full extent of the operator requirements in the design criteria.	05/04/22	ROK					05/04/22	CC
GEC.026	Section 20.1.1.3	RCCo	09/12/16	LEGACY Comment GEC16.090 - Accessible path from the existing 4th & Townsend Surface Station to the new UG Station will be maintain but there is NO direct connection to and from existing transit facilities to the platform level.	02/28/22	AG	A	Removed last bullet point: "Direct connections to and from existing transit facilities shall be accessible to the platform levels."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.027	Section 20.1.2.1	RCCo	09/12/16	LEGACY Comment GEC16.091 - Proposed 4th & Townsend UG Station length is only 700'. Design Criteria Platform length listed 800' long.	02/28/22	MJS	A	The minimum platform length has been updated to 875' per Caltrain direction (assumes 10-car EMU trainsets).	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.028	Section 20.1.2.1	RCCo	09/12/16	LEGACY Comment GEC16.092 - Request confirmation from Caltrain 1'-11" top of rail to top of platform – update accordingly (per response).	02/28/22	MM	A	Caltrain requirement = 23" per Caltrain letter 4/27/17 CHSRA requirement = 51"	05/04/22	ROK	Caltrain Platform height has been subsequently changed to 21.7" above TOR.				05/04/22	CC
GEC.029	Section 21.1	RCCo	09/12/16	LEGACY Comment GEC16.093 - Under stair emergency egress purpose only shall comply – besides NFPA 130 add CBC 433 (for fixed transit rail station)	02/28/22	AK	A	Revised text to read: "…NFPA 130 and CBC 443 (Fixed Guideway Transit and Passenger Rail Systems).	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.030	Section 21.3	RCCo	09/12/16	LEGACY Comment GEC16.094 - Add dedicated escalator controller room(s) are required to house escalator controller and disconnect equipment – such room(s) shall have compliant cooling / venting requirements (as applicable)	02/28/22	OA	A	Most requirements such as for loading, controls and key aspects for operation are noted under A.17.1. Listing all such requirements in criteria can be an issue especially if some are omitted or inadvertently and incorrectly transcribed. Ventilation, fire protection and structural requirements are all covered in other parts of the criteria. Suggest that referencing ASME A17.1 for escalator and elevators compliance is sufficient. Will add reference to ASME A17.1 in this section.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.031	Section 21.4	RCCo	09/12/16	LEGACY Comment GEC16.095 - Add elevator machine room(s) are required to house elevator equipment (per type of elevators) – such room(s) shall have compliant cooling / venting requirements (as applicable).	02/28/22	OA	A	Criteria should reference ASME A17.1 for elevator requirements for the same reasons noted in response to comment GEC16.094. Will add reference to ASME A17.1 in this section.	05/04/22	ROK	Caltrain Platform width has been subsequently changed to 33'-10".				05/04/22	CC
GEC.032	Section 21.4.4	RCCo	09/12/16	LEGACY Comment GEC16.096 - Confirm with Caltrain if there is a preference for type of elevator design to be incorporated, such as hydraulic, machine-room less (MRL)	02/28/22	AK	C	It is understood that the type of elevator will affect the design and requirements of the machine/control rooms for the elevators. Added text that says, "machine rooms will be provisioned with appropriate equipment related to the type of elevator that is chosen for the Fourth and Townsend Station."	05/04/22	ROK					05/04/22	CC
GEC.033	20.1	DF	10/01/18	LEGACY Comment GEC18.100 - Request confirmation extent of 'integration' between the existing 4th & Townsend Surface Station with the new Fourth & Townsend Station to avoid unnecessary redundancy – update accordingly	02/28/22	MM	C	For this revision of the design criteria, no further information is available from Caltrain and/or Prologis regarding integration. The design criteria is a living document and will be updated accordingly as plans for the Fourth and King Railyard mature.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.034	20.1.1.3	DF	10/01/18	LEGACY Comment GEC18.101 - Accessible path from the existing surface station to the new Fourth & Townsend Station will be maintain but there is NO direct connection to and from existing transit facilities to the platform level. Request clarification intent of 'direct connection'.	02/28/22	AG	A	See 2016 comment #90; Removed last bullet point: "Direct connections to and from existing transit facilities shall be accessible to the platform levels."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.035	20.1.2.1 Platforms	DF	10/01/18	LEGACY Comment GEC18.102 - Update platform lengths, widths and top of rail to top of platform height requirements	02/28/22	AK	A	Updated platform widths based off Matt's note in section 20.1.2.1. Split platform design requirements into two sections: one for Caltrain and one for CHSRA.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.036	20.3	DF	10/01/18	LEGACY Comment GEC18.103 - It's the understanding modification of the existing surface station is NOT part of DTX Work Scope	02/28/22	AK	A	Removed verbiage that said the DTX scope covered designing the modifications to the Fourth and King Street surface station and railyard. Caltrain will be performing this work instead.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.037	21.3.9.1	DF	10/01/18	LEGACY Comment GEC18.104 - Each escalator includes a controller cabinet & disconnect panel that will need to be 'housed' nearby – preferably in an Escalator Equip Room. Such room(s) shall have code compliant cooling / venting requirements	02/28/22	OA	A	Agree. Controller cabinets and panels should be within reasonable proximity of the escalator equipment for clear visibility during maintenance and testing procedures. Will add reference to ASME A17.1 in this section.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC

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Comments Closed	**131**
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GEC.038	Chapter 21, page 21-1 of 9	JB	10/01/18	LEGACY Comment GEC18.105 - Suggest that the Codes and Standards also include a reference to APTA Guidelines covering Heavy Duty Transit Escalators	02/28/22	AG	A	Added.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.039	Paragraph 21.3.8	JB	10/01/18	LEGACY Comment GEC18.106 - In addition to just stopping escalators in the event of a fire,2017 NFPA 130 paragraph 5.3.5.7 contains additional requirements that should be included in the criteria.	02/28/22	AK	A	Added language from NFPA 130, paragraph 5.3.5.7: "b. Escalators shall be constructed of noncombustible materials." "c. "...remotely as part of a pre-planned evacuation response; escalators shall be capable of being stopped locally by a manual stopping device at the escalator."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.040	Section 21.4	DF	10/01/18	LEGACY Comment GEC18.107 - Confirm with Caltrain if there is a preference for type of elevator design to be incorporated, such as hydraulic, machine-room less (MRL)	02/28/22	MM	C	Duplicate comment with GEC16.096. See that comment.	05/04/22	ROK					05/04/22	CC
GEC.041	Section 14.1.3.3, Platforms (Passenger Benches)	HK	08/03/22	The criteria notes that "Passenger benches" at the platform level must be included. However, there is no mention of benches at the Lower Concourse where it will provide waiting/seating areas for rail passengers at Salesforce Transit Center. Also, benches at the platform level should be confirmed with the operator since CHSRA was previously planning to keep passengers on the lower concourse before calling passengers to board and head down to the platform level. In addition, the platform widths and obstructions limit clearances at platform level, therefore, placement of benches will be restrictive.	09/22/22	OA	DE	Comment requires clarification - TJPA will need to define % of projected ridership (Currently unavailable or inaccurate - same for lower concourse)				10/07/22	MJS	The responder (PMPC Team) added a new bullet "passenger benches" to section 14.1.3.3 concourse and lower concourse comment; therefore this comment is considered closed. The responder (PMPC Team) recognizes that the quantity and location of benches will need to be defined once updated ridership numbers are provided by the operators during the next phase of design.	10/10/22	CC
GEC.042	Section 14.1.3.3, Platforms (Vertical Clearance)	HK	08/03/22	Due to existing conditions at transit center, large ventilation ducts running over the platforms and CHSRA platfrom height, vertical clearances from floor to ceiling of 12 feet cannot be met at the Salesforce Transit Center.	09/22/22	OA	DE	Revised as follows: •Vertical clearances between the floor and ceiling are not less than 12 feet in the general platform areas, unless precluded by existing building structure. If 12 feet vertical clearance cannot be achieved, any variance must be approved by TJPA.. •In limited areas, such as under partial mezzanines and at the platform ends next to the emergency stair and service area, vertical clearances may be reduced to 10 feet. "				10/11/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/11/22	CC
GEC.043	Section 14.2.1.3	RCCo	08/03/22	(CHSRA section, first bullet) Minimum side platform width for CHSRA for Fourth and Townsend Street Station is listed as 17'-10". That section of the architectural criteria is new and was not listed when we last reviewed the criteria in April. That dimension should also be 17'-0" so that the Fourth and Townsend Street Station design is compliant.	09/22/22	OA	A	Update criteria to reflect minimum platform width. Designer to confirm no adverse impact to level of service and egress				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/10/22	CC
GEC.044	Section 14.3.1.2, Plaform Level (Caltrain)	HK	08/03/22	The min. horizontal clearance of 25 feet for permanent structures and 16ft for minor structure would require a variance. Per latest variance request draft, it notes that Caltrain changed the minor structure clearance to 17ft. Should any of this information be reflected in this DTX criteria?	09/22/22	OA	A	Agree to modify to 17'-0" minimum horizontal clearance to structure from centerline of track				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/10/22	CC
GEC.045	Section 14.3.2.1, Lower Concourse Level AND Section 14.3.2.2, Platform Level	HK	08/03/22	The program spaces listed should align with the latest program used to generate the preliminary engineering drawings based on feedback from TJPA and the rail operators.	09/14/22	MM	A	Agree. The text will be updated to reflect the current programmatic spaces spreadsheet.				10/17/22	KS	Aligned requirements in sections 14.3.2.1 and 14.3.2.2 with the information from programmatic space spreadsheet "Draft Calculation of CHSRA space rqmts -per Final 30% Design Tech Memo"	11/10/22	cc
GEC.046	Section 14.6.4.3, Design Features (Elevators)	HK	08/03/22	At the transit center and for phase 2, there will be passenger and service elevators. Each platform will have a dedicated service elevator. Should there be some mention of this in the design criteria? For additional information, refer to preliminary engineering architectural tech memo-Appendix B.2 submission.	09/22/22	OA	A	A service elevator will be required (or one of passenger elevators must have that capability) between platform level and street level. Added the following sentence to section 16.6.4.2: "Each platform at Salesforce Transit Center and Fourth and Townsend Street Station must have one dedicated service elevator."				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/10/22	CC
GEC.047	Section 14.6.4.3, Design Features (Freight Elevators)	HK	08/04/22	Are 10,000lbs "interior" freight elevators being used at Fourth and Townsend Station or at Tunnel Vent Buildings? Salesforce Transit Center only has the 10,000lbs "loading dock" SERVICE elevators, not "FREIGHT". Also, rated speed of the 10,000lb service elevator at the transit center is 200fpm., not 350fpm. For additional information, refer to preliminary engineering architectural tech memo-Appendix B.2 submission.	09/22/22	OA	A	Criteria updated to be consistent with the Phase 1 elevator requirements.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/10/22	CC

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Cal.001	Chapter 14	BZ	04/21/22	reconcile chapter number with section 1.6 Design Criteria Organization; renumber chapter subsection accordingly	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Chapter 14 - 14.1.3	BZ	04/21/22	coordinate subsection numbering	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.003	Chapter 14 - 14.1.3	BZ	04/21/22	reference **Environment and Shared Design Characteristics** subsection for station design criteria	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.004	Chapter 14 - 14.1.3.3	BZ	04/21/22	platform elevation requirements for Caltrain and CHSR rail cars; restart list at a.	05/13/22	MM	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.005	Chapter 14 - 14.1.3.4	BZ	04/21/22	include subsection for **Vertical Circulation**; reference corresponding subsection number for design criteria	05/13/22	AK	C	Section is provided as Section 14.6							05/16/22	CC
Cal.006	Chapter 14 - 14.2.1	BZ	04/21/22	coordinate subsection numbering	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.007	Chapter 14 - 14.2.1.3	BZ	04/21/22	specify station is to be designed with outboard platform arrangement	05/19/22	MM	A	Text has been revised to provide platform widths for both side platforms and center platforms.	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
Cal.008	Chapter 14 - 14.2.1.3	BZ	04/21/22	18 feet per Caltrain Standard. Add "Submit a Design Variance to Caltrain for Approval for nonstandard design." at the end of the paragraph.	05/19/22	MM	A	Text has been added to paragraph.	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
Cal.009	Chapter 14 - 14.2.1.4	BZ	04/21/22	revise to "5 feet 8 inches" Per the email confirmation from Caltrain	05/19/22	MM	A	Text has been revised to 5'8".	05/19/22	ROK		05/19/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/19/22	CC
Cal.010	Chapter 14 - 14.2.1.3	BZ	04/21/22	restart list at a.	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.011	Chapter 14 - 14.2.1.3	BZ	04/21/22	coordinate subsection numbering	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.012	Chapter 14 - 14.2.2	BZ	04/21/22	omit 'assumed'	05/13/22	AK	A	Text has been revised.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.013	Chapter 14 - 14.2.2.1	BZ	04/21/22	coordinate chapter number(s)	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.014	Chapter 14 - 14.2.2.2	BZ	04/21/22	include separate CHSRA platform level criteria similar to the Transit Center	05/25/22	MM	A	Text has been revised.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.015	Chapter 14 - 14.3.1.2	BZ	04/21/22	specify station is to be designed with center platform arrangement	05/23/22	MM	B	This is not a requirement, but is the current design scheme. It is memorialized in the 30% design documents and the Phasing Study.				05/23/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/23/22	CC
Cal.016	Chapter 14 - 14.3.1.2	BZ	04/21/22	revise list to g.	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.017	Chapter 14 - 14.5	BZ	04/21/22	omit 'generally'; revise reference section to **Fire - Life Safety**; coordinate subsection reference	05/25/22	OA	A	Text has been revised. Reference section added.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.018	Chapter 14 - 14.5	BZ	04/21/22	coordinate chapter numbering	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.019	Chapter 14 - 14.6.2	BZ	04/21/22	restart list at a.	05/13/22	AK	A	To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.020	Chapter 14 - 14.6.3.2	BZ	04/21/22	reference **Seismic Design** chapter for seismic design parameters	05/25/22	OA	A	Reference section added.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.021	Chapter 14 - 14.7	BZ	04/21/22	begin new subsection for **Elevators**; revise subsequent subsection numbering	05/13/22	MM	DE	To be evaluated by PMPC Team during technical edit	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.022	Chapter 14 - 14.7	BZ	04/21/22	revise bullet for list value e.	05/13/22	AK	A	(Section is now 14.6.3.6) To be revised by PMPC Team	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.023	Chapter 14 - 14.7	BZ	04/21/22	include Seismic Design heading; reference **Seismic Design** chapter for seismic design parameters	05/25/22	OA	A	Reference section will be added.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
Cal.024	Section 20.1	BZ	10/18/18	LEGACY Comment Cal18.042 - Section 20.1 Fourth and Townsend Street Station (first paragraph, highlighted text - "The Fourth and Townsend underground station shall be designed and configured for the exclusive use of Caltrain." [ZB] Verify whether HSR will make a stop here. [DK] Yes, please update as it is my understanding CHSRA is planning to have trains stopping here.	05/04/22	MJS	A	California High-Speed Rail will stop at Fourth and Townsend Street Station 4x per peak hour per direction based on latest 2020 Business Plan.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.025	Section 20.1.2.1	BZ	10/18/18	LEGACY Comment Cal18.043 - Section 20.1.2.1 Public Areas, under "Platforms" (bullet "a", highlighted text - "The minimum platform width shall be 16 feet.") Verify whether only an outboard platform will be adopted at Fourth and Townsend Street Station.	05/04/22	MJS	C	The Executive Steering Committee voted to adopt Concept C (and associated sub-concepts B' and B'-Reduced) in September 2021 - concept features center island and outboard platforms at Fourth and Townsend Street Station.							05/16/22	CC
Cal.026	Section 20.1.2.1	BZ	10/18/18	LEGACY Comment Cal18.044 - Section 20.1.2.1 Public Areas, under "Platforms" (bullet "b", highlighted text - "..800 feet.") [ZB] 875 feet is a minimum platform length of 10-car consist. [DK] Per JPB's letter, platform length should be 875 feet.	05/04/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 3-10]: "Platform length: The standard platform length shall be 875 feet to accommodate a 10-car EMU consist. See Figure 3-5.." Caltrain minimum platform length will be updated throughout the design criteria to 875 feet (10-car consist).	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

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Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 14, Architecture*		
Document date:	*2/28/2022*		

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AB (Caltrain)	AB	Bin Zhang (Caltrain)	BZ
James Deane (CHSRA)	JRD	Paul Hebditch (CHSRA/HNTB)	PH
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Cal.027	Section 20.1.2.1	BZ	10/18/18	LEGACY Comment Cal18.045 - Section 20.1.2.1 Public Areas, under "Platforms" (bullet "b", highlighted text - "750 feet.") 850 feet should be maintained for a minimum platform length.	05/04/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 3-10]: "Platform length: The standard platform length shall be 875 feet to accommodate a 10-car EMU consist. See Figure 3-5.." Caltrain minimum platform length will be updated throughout the design criteria to 875 feet (10-car consist).	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.028	Section 20.1.2.1	BZ	10/18/18	LEGACY Comment Cal18.046 - Section 20.1.2.1 Public Areas, under "Platforms" (bullet "e", highlighted text - ".. 1 foot 11 inches..") [ZB] Verify the lower floor height for Caltrain EMU to meet the level boarding requirement. [DK] Floor height of the EMU is 21.85" above top of rail	05/04/22	MM	A	Updated text accordingly.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.029	Section 20.2 Table 20.4	BZ	10/18/18	LEGACY Comment Cal18.047 - Table 20.4, Transit Center Platform Dimensions (Caltrain's minimum platform length "800 ft") Update to "875 ft"	05/04/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [pp 3-10]: "Platform length: The standard platform length shall be 875 feet to accommodate a 10-car EMU consist. See Figure 3-5.." Caltrain minimum platform length will be updated throughout the design criteria to 875 feet (10-car consist).	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.030	Section 20.2 Table 20.4	BZ	10/18/18	LEGACY Comment Cal18.048 - Table 20.4, Transit Center Platform Dimensions (Caltrain's minimum platform width "26 ft min.") Update to "28 ft min."	05/04/22	MJS	A	Will comply	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.031	Section 20.2 Table 20.4	BZ	10/18/18	LEGACY Comment Cal18.049 - Table 20.4, Transit Center Platform Dimensions (Caltrain's Platform height (above top of rail) - "1 ft 11 in.") [ZB] Verify the lower floor height for Caltrain EMU to meet the level boarding requirement. [DK] Floor height of the EMU is 21.85" above top of rail	05/04/22	MM	A	Updated text accordingly.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC

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HSR.001	14 - General	JRD	04/15/22	General comment- do not use should, would, could, may, or consider, those words do not require compliance and so are not requirements	05/18/22	MM	DE	PMPC to ensure consistent use of approved words for document.							05/18/22	CC
HSR.002	14 - General	JRD	04/15/22	General comments- I do not see references to APTA standards except for general statement in references for elevators and escalators- they should be considered	05/25/22	OA	A	APTA reference has been added.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.003	14 - General	JRD	04/15/22	Materials- consider how to address damage to materials and impacts to operations- e.g. a broken glass handrail would make stair unusable until the panel is replaced with a code compliant temporary material or new permanent material- these kinds of incidents can significantly impact operations if they limit passenger access to the system	05/25/22	OA	C	Section 14.4.6 includes material performance criteria. Concerns for downtime due to damages can be mitigated with allowances for spares.							05/26/22	CC
HSR.004	14 - General	JRD	04/15/22	Consider how will future escalator and elevator replacement be accomplished in the future?	05/25/22	OA	DE	Finishes will require careful placement and consideration and can be demountable to allow convenient access to conveyance equipment for maintenance and/or replacement.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.005	14.1.2	JRD	04/15/22	Include FRA accessibility requirements. Consider language to address conflicts between, CBC, ADAAG, FRA, and other local accessibility requirements	05/25/22	OA	A	Reference text will be added.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.006	14.1.3.1	JRD	04/15/22	How will you manage homeless sleeping in doorways	05/23/22	MM	C	The TJPA has a security policy to address this concern.							05/23/22	CC
HSR.007	14.1.3.1	JRD	04/15/22	100 year sea level rise should be based on RCP 8.5 climate criteria	05/13/22	AK	C	PMPC issued a memo regarding the estimate of the critical inundation elevation that the DTX station entrances and tunnel portal must be constructed at so that the stations will not be inundated in case of a 100-year flood. The elevation was determined by using the RCP 8.5 criteria.							05/16/22	CC
HSR.008	14.1.3.2	JRD	04/15/22	Will TVM and Fare Control for HSR be by HSR Train Operator (TO) or will DTX provide- suggest it should be by HSR TO and that there be dedicated Information Communications Technologies (ICT) pathways to dedicated server racks- they can be in dedicated room or in shared room in cages	05/26/22	MM	C	CHSRA has not selected a train operator at this time. The DCM will be updated when CHSRA has selected a rolling stock and this information can be included at that time if a train operator has also been selected.							05/26/22	CC
HSR.009	14.3.2	JRD	04/15/22	HSR ticket window is an information booth only with no sales but must be adjacent to HSR TVM so staff can support customers with ticketing problems	05/23/22	MM	C	It is the intent to locate TVM along the length of the stations to provide convenient access for patrons. The information booth can be located near one set of TVMs.				05/23/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/23/22	CC
HSR.010	14.1.3.3	JRD	04/15/22	Platforms require blue light phones for emergency communications	05/23/22	MM	A	Will be added to list of requirements.				05/23/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/23/22	CC
HSR.011	14.2.1.1	JRD	04/15/22	List missing HSR signage	05/23/22	MM	A	Will add "HSR signage, where applicable"				05/23/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/23/22	CC
HSR.012	14.3.2.2	JRD	04/15/22	Can HSR maintenance equipment spaces be removable? Because the final operator and service plan is not in place the space needs may change and, if spaces are removable if not needed that will improve platform mobility	05/23/22	MM	C	The station fit out design can consider this as an option for future flexibility. Do not recommend changes to the design criteria at this time. It is anticipated that the design criteria will be updated when CHSRA rolling stock is known. This can be reviewed again at that time.							05/23/22	CC
HSR.013	14.4.2	JRD	04/15/22	As both stations are underground how will natural light be maximized?	05/23/22	AK	C	One of the main features of the Transit Center is the light column, which brings light through lower levels. The Fourth and Townsend St. Station is beneath the roadway reducing opportunities for natural light.							05/26/22	CC
HSR.014	14.4.2	JRD	04/15/22	Provide a reference standard for best practice such IALD or ATPA	05/26/22	OA	B	Electrical references should remain with Chapter 17.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.015	14.4.5	JRD	04/15/22	Suggest additional dedicated braille on handrails	05/26/22	OA	DE	Location of braille will be evaluated and allocated as per ADA standards.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.016	14.4.5	JRD	04/15/22	Signage colorway should consider elderly low visual comprehension fonts and colorways	05/23/22	AK	C	Colorway and design will follow MTC Hub Signage standards.							05/23/22	CC
HSR.017	14.4.6.2	JRD	04/15/22	Do not limit vandalism cleaning to only 9' - this should apply to all exposed surfaces	05/26/22	OA	B	Vandalism is typically experienced on surfaces within direct reach of the public. Above 9' may be impractical and even costly. This requires evaluation and can be updated in the next revision of the DCM, if necessary.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.018	14.4.6.5	JRD	04/15/22	Provide design criteria and consider prohibiting the use of thinset systems	05/26/22	OA	DE	This is typically provided in specifications. This requires evaluation.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.019	14.4.6.6	JRD	04/15/22	Conflicts with need to provide glare free surfaces as glare impact users with visual impairments. High reflectivity surfaces require more maintenance to maintain the desired lighting, Require LED lighting to reduce energy requirements	05/26/22	OA	A	Text revised to better articule material reflectivity without minimizing safety.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.020	14.4.6.7	JRD	04/15/22	Consider easily replaceable materials in high contact areas.	05/26/22	OA	A	Will comply	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.021	14.4.6.8	JRD	04/15/22	Provide allowable acoustical performance for each space type or point to a reference standard to meet	05/26/22	OA	DE	Acoustical performance will vary by location and objective. This requires evaluation to identify what is appropriate maintain speech intelligibility in public areas, both at platform and at concourses.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.022	14.6.1.2	JRD	04/15/22	Suggest requiring queuing analysis to determine runoff and queuing requirements	05/26/22	OA	DE	Agree. This is based on ridership and requires evaluation including a pedestrian flow analysis.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.023	14.6.1.1	JRD	04/15/22	LOS needs to consider two way movement- consider one way stair flows to improve passenger movement.	05/26/22	OA	DE	Passenger movement evaluation depends on ridership and overall station configuration. While single directional VCEs may improve passenger flow in some cases, a full evaluation is required.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.024	14.6	JRD	04/15/22	As a general rule I avoid stating code requirements as they can change between planning and construction. Compliance with CBC is mandatory so restating its requirements is redundant.	05/26/22	OA	A	Text will be revised to not restate codes.	05/26/22	ROK		05/26/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.025	14.6	JRD	04/15/22	Can escalators slow to stop and reverse to egress direction while fully loaded? This will help with egress capacity requirements	05/26/22	OA	B	As an operational practice this is not done for safety reasons. The system will be sized both for peak operations as well as emergency conditions.				05/26/22	MM	Comment response is satisfactory to TJPA.	05/26/22	CC
HSR.026	14.6.3.7	JRD	04/15/22	Size elevators to ensure the can move the train headway disabled population based on average % of disabled population.	05/26/22	OA	DE	Agree. This is based on ridership and requires evaluation. This can be included in the next revision of the DCM as ridership is better understood.				05/26/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/26/22	CC
HSR.027	Section 20.1, 20-1	PH	10/01/18	LEGACY Comment HSR18.017 - CHSR will also operate at 4th and Townsend therefore design and configuration should also meet their requirements	05/04/22	AG	A	Revised text to read: "…configured for the use of Caltrain and California High Speed Rail Authority (CHSRA)." "CHSRA Design Criteria" and "CHSRA Environmental and Engineering Technical Memoranda" added to Codes and References	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.028	Section 20.1.2.1, 20-3 (Station Entrances)	PH	10/01/18	LEGACY Comment HSR18.018 - Fourth and Townsend should also be identifiable as a CHSR station	05/04/22	AG	A	Revised to read as follows: "..and recognizable as a part of the blended Caltrain and CHSRA system."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.029	Section 20.1.2.1, 20-5 (Platforms)	PH	10/01/18	LEGACY Comment HSR18.019 - Section needs revision to accommodate CHSR operation at Fourth and Townsend	05/04/22	MM	A	Revised.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC

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OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.030	Section 20.3, 20-12	PH	10/01/18	LEGACY Comment HSR18.020 - Section needs revision to accommodate CHSR operation at Fourth and Townsend	05/04/22	MM	A	Revised.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.031	Section 20.1.2.1, 20-6	MBr	10/01/18	LEGACY Comment HSR18.049 - 20.1.2.1 All 51" platforms the area below the "safe area" shall be sized to allow O&M staff members access to inspected the EMU's / Trainset's running gear while they are stationary next to the platform. Reference HSR TM 2.2.4, Section 3.3.10.	05/04/22	AG	A	Added bullet "i." to platform geometric requirements: "A clear refuge space shall be provided under the platform edge at the track level. Refuge areas shall be a minimum of 30 inches high and 30 inches deep along the entire length of the platform. Exits from this space shall be provided at platform ends. If platform gates or doors are provided, these areas are not required."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.032	Section 2.1.2.2, 20-7	MBr	10/01/18	LEGACY Comment HSR18.050 - 20.1.2.2 Owner and Operator Areas - similar facilities shall be provided for CHSRA O & M personnel	05/04/22	AG	A	Included CHSRA.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.033	Table 20.1, 20-8	MBr	10/01/18	LEGACY Comment HSR18.051 - Table 20.1 Train & locomotive noise passing/entering/leaving shall meet or be less than specified in CFR49 Part 210 App. A per the FRA's measuring criteria	05/04/22	OA	A	Within stations, noise levels must comply with Appendix A to Part 210 - Summary of Noise Standards, 40 CFR Part 201. Noise levels whether trains are stationary or moving shall consider track type (ballast, ties, concrete, etc.). Preferred: 65 - 85 dBA max. This will be added to the chapter.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.034	Section 20.1.5.3, 20-9	MBr	10/01/18	LEGACY Comment HSR18.052 - 20.1.5.3 Resistance to Vandalism - the platform area will have intrusion protection and close circuit video surveilles 24/7 to protect trainsets and EMUs from vandalism and graffiti	05/04/22	AG	A	Added last paragraph: "Platform areas will have intrusion protection and closed circuit video surveillance 24 hours a day, seven days a week to protect trainsets and EMUs from vandalism and graffiti."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.035	Table 20.4, 20-12	XB	10/01/18	LEGACY Comment HSR18.053 - Table 20.4 - Platform height (above top of rail) = 51" (CHSRA)	05/04/22	MJS	A	Platform height above TOR updated accordingly.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.036	Table 20.4, 20-12	MBr	10/01/18	LEGACY Comment HSR18.054 - Bottom of Table 20.4 the safety zone shall be high enough to allow for inspection personnel to visually inspect the trainset's running gear and couple and uncouple cars. Reference HSR TM 2.2.4, Section 3.3.10.	05/04/22	AG	C	TM 2.2.4 Section 3.3.10 states 30"x30" minimum. DC follows this requirement.							05/18/22	CC
HSR.037	Section 20.3, 20-12	XB	10/01/18	LEGACY Comment HSR18.055 - 20.3 - Confirm that the Fourth and King Street station is for the exclusive use of Caltrain.	05/04/22	MM	A	Updated to reflect that modifications to the Fourth and King St. Station will be performed by Caltrain.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.038	Chapter 20 (General)	JRD	10/01/18	LEGACY Comment HSR18.077 - Reference CHSRA design requirements and coordinate relevant standards	05/04/22	AG	A	Added throughout Chapter.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.039	Chapter 20 (Codes and Standards)	JRD	10/01/18	LEGACY Comment HSR18.078 - Why are NFPA 101 and 220 included? - they are not state recognized codes	05/04/22	OA	C	NFPA 130 standard applies to transit rail and often non-public areas on transit facilities governed by other codes including state codes through 101 invoke NFPA 130. For this reason these are included. All other state codes are applicable and will not be replaced by 101 or 220.							05/18/22	CC
HSR.040	Chapter 20 (General)	JRD	10/01/18	LEGACY Comment HSR18.080 - CHSRA design criteria need to be incorporated	05/04/22	AG	A	Added throughout Chapter.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.041	Section 20.1.4.5.f, 20-9	JRD	10/01/18	LEGACY Comment HSR18.081 - change "or" to "and"	05/04/22	AG	A	Revised.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.042	Section 20.2, 20-12	JRD	10/01/18	LEGACY Comment HSR18.082 - Add CHSRA 4th & Townsend and 4th & King criteria	05/04/22	MM	C	Included in previous section for Fourth and Townsend St. Station.							05/18/22	CC
HSR.043	Section 21.4.3, 21-6	JRD	10/01/18	LEGACY Comment HSR18.083 - Elevator quantity and size shall be capable of moving an representative average ambulatory disabled population within peak train headway period	05/04/22	AK	C	The minimum number of elevators are provided in Section 21.4. The minimum size of each elevator will be determined based on the load capacity or the minimum size to fit at least one horizontally positioned stretcher or gurney.							05/18/22	CC
HSR.044	Section 21.4.7, 21-9	JRD	10/01/18	LEGACY Comment HSR18.084 - Provide duplicate elevatoring to allow for elevator maintenance without impacting ambulatory disabled access to platform	05/04/22	AK	C	The number of elevators are provided in Section 21.4, which states that there will be a minimum of two elevators connecting the street level to mezzanine/concourse level and the mezzanine/concourse level to the platform level. Section 21.4 also states that the platforms will remain fully accessible even when one elevator is out of service.							05/18/22	CC
HSR.045	Section 2.1.2.f, 2-1 & Section 20.1, 20-1	XB	10/01/18	LEGACY Comment HSR18.021 - 2.1.2 F and 20.1 - Confirm that the Fourth and Townsend Street Station is to accommodate Caltrain service only. HSR requires usage at the Fourth and Townsend Station.	05/04/22	AG	A	Revised text to read: "…shall accommodate both Caltrain commuter and high-speed train service."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
TA.001	Section 14.1.3.2 (First list, Second bullet)	LZ	07/04/22	Add Clipper (or other regional system) card charging stations	09/13/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.002	Section 14.1.3.2 (Second list, Third bullet)	LZ	07/04/22	Urinals with stalls, doors and security latches?	09/22/22	OA	A	Revised to read as "Urinals with stall"				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.003	Section 14.1.3.3 (Second to last bullet)	LZ	07/04/22	Caltrain platforms are 21.7" above rail	09/13/22	MJS	A	Revised as noted				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC
TA.004	Section 14.2, Fourth and Townsend Street Station	LZ	07/04/22	This is more complicated than it appears. Integrating with 4th and King station avoiding redundancy may result in shortfall once/if the existing station is eliminated and replaced at a later time with a different configuration	10/05/22	MJS	A	Revised sentence for clarity/intent.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical and the revised sentence was accepted.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.005	Section 14.2.1.1 (Last bullet)	LZ	07/04/22	Delete last bullet. It has HSR transfering to itself	09/13/22	MJS	B	Disagree, riders getting off at Fourth and Townsend Street Station can be either Caltrain or CHSRA passengers. Certainly they can transfer from CHSRA to Caltrain and vice versa.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed that the bullet should be deleted.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and the responder revised their response to address comment; therefore this comment is considered closed.	10/05/22	CC
TA.006	Section 14.2.1.3 (Fifth bullet)	LZ	07/04/22	Statement implies that the distance from center of track and platform face is the same for both operatirs. Is that the case?	09/13/22	MJS	B	Disagree, there is a subheader "Caltrain" above this list under section (14.2.1.3, Platforms). PMPC Team belives this clearly refers to Caltrain dimensions only.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical and the revised sentence was accepted.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.007	Section 14.2.2.1, Concourse Level	LZ	07/04/22	Why would DTX provide bus operator facilities at 4th/Townsend? Is this even in the scope? If MTA wants them, who pays for them? At STC they already exist	09/13/22	MJS	B	Disagree, the criteria reads "Bus operator facilities may also need to be provided, but this decision is pending with SFMTA.". The intent of this language is to make the designer aware of the potentiality, not the requirement.	10/05/22	LZ	During CRM with SF CTA on 10/5 - it was agreed the approach was logical and the revised sentence was accepted.	10/05/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/5 and agreed to PMPC response; therefore this comment is considered closed.	10/05/22	CC
TA.008	Section 14.3.2.1 (2nd bullet under Caltrain Facilities)	LZ	07/04/22	Parking for three ladder rack trucks at the lower concourse level?	09/22/22	OA	A	Revised to "street level" (original sentence WAS NOT exactly like note says here. Still made edit to "street level")				09/27/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	09/27/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments	**41**
Comments Closed	**41**
% Complete	**100%**

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 15, Fire-Life Safety*		
Document date:	*2/28/2022*		

Reviewers			
Name	Initials	Name	Initials
John Bumanis (Design Team/Parsons)	JB	Randy Volenec (Design Team/PC Parch)	RV
Yiming Sun (Design Team/MJA)	YS	Bin Zhang (Caltrain)	BZ
Pete Gutierrez (Caltrain)	PCG	Joel Pancoast (Caltrain)	JP
James Deane (CHSRA)	JRD	M. Brunner (CHSRA)	MBr
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Nader Shahcheraghi (PMPC SME/ AECOM)	NS		

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment

BRS - Back-check Response Status
CC - comment closed
OPEN - requires comment closure meeting and/or resolution

Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	15.1 - Design Fire Size	JB	04/08/22	Consider keeping the table that is currently provided in the 2009 edition of the criteria. This Table presents information (e.g. MW for trash) that isn't in the RVA criteria. The train fire heat release rate and growth rate are also consistent with the current SES/CFD work being performed.	05/17/22	NS	A	Added the table back into section 15.1.	08/05/22	BCC	The train fire heat release rate and growth rate (and current SES/CFD modeling work) requires further discussion	10/06/22	MJS	Noted. Design Criteria can be updated after further discussion considering SES and CFD analysis modeling. CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
GEC.002	15.1 - Design Fire Size, ¶1-1	JB	04/08/22	Revise first sentence to read as follows: "In addition to data provided in Table 15.1, the tunnel.."	05/17/22	NS	A	The intro sentence reads: "Design fire sizes are shown in Table 15.1." The following sentence appears after the table: "In addition to the design fire sizes shown in Table 15.1, tunnel and station design must accommodate the fire sizes indicated in the Program's Final Risk and Vulnerability Assessment."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	15.1 - Design Fire Size, ¶1-1	JB	04/08/22	Return Table 15.1 Design Fire Sizes to section.	05/17/22	NS	A	Done				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	15.2.b - Emergency Management (Public address system)	RV	04/08/22	Note: Transit Center is equipped with an Emergency Communications System/Mass Notification System that operates over the PA system.	05/17/22	NS	C	Noted.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	15.4.3 - Station Deluge System, ¶1-1	RV	04/08/22	Revise first sentence to read as follows: "… in the Fourth and Townsend Street Station and the Transit Center."	05/17/22	NS	A	Done				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	15.6 - Blue Light Station, ¶2, fifth bullet	JB	04/08/22	Add bullet "120 volt duplex convenience electrical outlet (see electrical criteria)	05/17/22	NS	A	Done				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	Sect. 22	YS		LEGACY Comment GEC18.109 - This chapter does not provide any requirements of fire resistance from the structural performance perspectives such as adding micro pp fibers in the concrete mix for the final lining. Should this be required?	02/28/22	NS	C	SME Nader Shahcheraghi: "NFPA 130 (2020) Sections 5.2 and 6.2 specify construction types acceptable for stations and tunnels, respectively. The fire resistance rating of the underground structures are specified in these sections through construction type. Also, the second paragraph of the Scope indicates that fire resistant construction criteria is provided in the Structures chapter of the DCM."	05/04/22	ROK	No additional comment				05/04/22	CC
GEC.008	Paragraph 22.4	JB		LEGACY Comment GEC18.110 - Consider prohibiting embedded fire suppression system piping.	02/28/22	NS	A	This requirement is likely intended to facilitate the ease of maintenance and repair of fire protection system piping and should be considered in the design of this system.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.009	22.7.2	JB		LEGACY Comment GEC18.111 - Define fire rating (e.g. 2 hours) of enclosure.	02/28/22	NS	A	SME Nader Shahcheraghi: "According to NFPA 130, Section 6.3.3.10, 'exit stairs and doors shall comply with Chapter 7 of NFPA 101, except as herein modified.' Fire rating depends on the number of floors and other factors, such as if there are cross-passage doors." Added language in Section 14.7.2 to address this.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.010	Chapter 22/23-General	JB		LEGACY Comment GEC18.108 - Per NFPA 130 paragraph 7.2.6.1 "The criteria for tenability and time of tenability for stations and trainways shall be established and approved." Tenability criteria and time requirements need to be developed and incorporated into the criteria.	02/28/22	NS	DE	NFPA 130 provides guidance on tenability criteria in section B.3. Required time of tenability shall be developed for each station based on input from fire department and first responders as well as for developing the Emergency Response Plan.	05/16/22	ROK					05/16/22	CC
GEC.011	Chapter 15 - General	JB	06/23/22	Consider prohibiting embedded fire suppression system piping.	09/20/22	NS	A	No objection to request. Revised as noted (Section 15.4.1 and 15.4.2)	10/06/22	ROK	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to address comment in the DTX Design Criteria.	10/06/22	MJS	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to address comment in the DTX Design Criteria. Comment is considered closed.	10/06/22	CC
GEC.012	15.1	JB	06/23/22	This section requires that the design train fire size and growth rate conform to the fire sizes indicated in the Transbay Program's Final Risk and Vulnerability Assessment. This may not be feasible with the current system. In addition, the fire heat release rates mandated by RVA criteria are higher than what is being used for the current SES/CFD task.	09/20/22	NS	B	See response to item GEC.001 Fire size and growth rate should be based on the design rolling stock and can not be determined arbitrarily based on what is feasible for the current system. The system should be designed to meet the design criteria, not the other way around.	10/06/22	ROK	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed treat this comment in same fashion as GEC.001.	10/06/22	MJS	Noted. Design Criteria can be updated after further discussion considering SES and CFD analysis modeling. CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
GEC.013	15.2 Emergency Manangement	CU	07/01/22	Include the Transit Center in the first paragraph of section 15.2	09/30/22	MJS	A	Revised as follows: "Caltrain's Central Control Facility (CCF) will have the ability to manage all emergency situations occurring in the tunnel and, the Fourth and Townsend Street Station, and portions of the Salesforce Transit Center Station (pending the master cooperative agreement and future CONOPS agreements)."				10/04/22	MJS	The responder (PMPC Team) provided clarification to original comment inquiry, no change required - comment is considered closed.	10/04/22	CC
GEC.014	15.7.1 Walkways	LY	08/03/22	In reference to bullet point " Have handrails, the handrails must not obstruct egress from trains." Are we showing handrails on emergency egress walkways in the tunnel?	09/30/22	MJS	C	The PE design of tunnel cross-sections that have been reviewed by PMPC Team have included handrails along the length of the walkway (except at egress points). The handrails are located against the tunnel wall, not between the train and the walkway so they will not impede egress.	10/06/22	ROK	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Design team agreed with PMPC response.	10/04/22	MJS	The responder (PMPC Team) provided clarification to original comment inquiry, no change required - comment is considered closed.	10/04/22	CC
GEC.015	15.7.1 Walkways	LY	08/03/22	Following bullet "Include signage at regular intervals that indicates the emergency egress direction and distances to the nearest exits in both directions." Clearly identified cross-passageway doors within the partitioned tunnel section	09/30/22	MJS	A	Revised as follows: "Have handrails; the handrails must not obstruct egress from trainsmust be located opposite of track, adjacent to tunnel wall, and not obstruct egress from trains. " (Matt edited this, should I change it back?)				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Cal.001	Chapter 15	BZ	04/21/22	Reconcile chapter number with section 1.6 Design Criteria Organization; renumber chapter subsection accordingly	05/13/22	AK	A	Chapter 1 has been updated to reflect current chapter organization.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Chapter 15	BZ	04/21/22	AREMA	05/13/22	AK	A	AREMA Manual for Railway Engineering is the third bullet under Codes, Standards and Guidelines	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.003	Chapter 15.4	BZ	04/21/22	Reference NFPA 14	05/13/22	AK	C	NFPA 14 is listed as a reference	05/17/22	ROK					05/17/22	CC
Cal.004	Chapter 15.6	BZ	04/21/22	Coordinate chapter numbering	05/13/22	AK	A	Chapter numbering will be coordinated during production.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.005	Chapter 15 Section 15.7.1; (Page 15-9 of 10)	PCG	06/21/22	With the exception of walkways between tracks, hand rails are required on all walkways within tunnels and subways.	09/13/22	MJS	A	Revised as follows: "Have handrails; the handrails must not obstruct egress from trainsmust be located opposite of track, adjacent to tunnel wall, and not obstruct egress from trains. "				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.006	Chapter 15 Section 15.7.1; (Page 15-9 of 10)	JP	06/30/22	revise 5th bullet; handrails to be located opposite of track, adjacent to tunnel wall	09/13/22	MJS	A	Revised as follows: "Have handrails; the handrails must not obstruct egress from trainsmust be located opposite of track, adjacent to tunnel wall, and not obstruct egress from trains. "				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.007	Chapter 15 Section 15.7.2; (Page 15-9 of 10)	JP	06/30/22	second sentence; include San Francisco Building Code	09/13/22	MJS	A	Revised as noted.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.001	15 - General	JRD	04/15/22	smoke detectors- consider dust for detectors in platforms	05/17/22	NS	A	Noted. Added to smoke detectors section in 15.3.2.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.002	15 - General	JRD	04/15/22	Add FRA accessibility requirements	05/17/22	NS	A	Added: •Federal Railroad Administration (FRA) Accessibility Standards Applying to Passenger Rail Cars				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.003	15 - General	JRD	04/15/22	Confirm NFPA 101 requirements apply- I see only one reference to doors but those will be governed by CBC	05/17/22	NS	C	NFPA 101 applies where NFPA 130 references it.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.004	15 - General	JRD	04/15/22	Where are you using NFPA 101A?	05/17/22	MM	A	Removed reference to NFPA 101A.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.005	15 - Codes and Standards	JRD	04/15/22	Is NFPA 101 actually used by the CBC? NFPA 130 defers CBC is NFPA 101 is not adopted	05/17/22	NS	C	NFPA 101 is used where NFPA 130 references it.	05/17/22	ROK					05/17/22	CC
HSR.006	15.1	JRD	04/15/22	When will risk assessment be provided	05/13/22	AK	C	The Risk and Vulnerability Assessment is being rebranded as the Threat and Vulnerability Assessment and will be ready by July 6, 2022.							05/17/22	CC
HSR.007	15.2	JRD	04/15/22	Consider requirements to require radio repeaters and to require contractor to demonstrate all spaces have a minimum signal strength. This applies to Wi-Fi as well	05/13/22	NS	C	I believe this is implied for radio communications systems related to fire emergency conditions. For non-emergency operations such as maintenance work and Wi-Fi coverage this suggestion should be evaluated by owner with input from designer and will be included in the project specifications, not the design criteria.							05/17/22	CC
HSR.008	15.3.2.3	JRD	04/15/22	Consider requiring cctv coverage for manual pull stations in public areas or pullboxes with integrated cameras	05/13/22	NS	A	No objection to request. Added criteria to section 15.3.2.3.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.009	Section 22.2 22-2	MBr		LEGACY Comment HSR18.056 - 22.2 Emergency Management - should include wayside information obtained via the onboard diagnostics and health monitoring system which included smoke, fire and heat monitoring and fire extinguishing systems.	02/28/22	NS	A	Designer should refer to NFPA 130 for life safety equipment requirements needed in transit or rail systems. Smoke and heat detectors are appropriate in station buildings only, not in the tunnel structures.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.010	Section 22.4.1, 22-6	MBr		LEGACY Comment HSR18.057 - 22.4.1 Standpipe - will standpipes be located at station platform tracks?	02/28/22	AK/NS	A	Fire hose cabinets will be provided on the platforms, but not at the tracks themselves. Standpipe outlets will be provided every 200 feet. (NS) NFPA 14 requires a standpipe at each end of each platform.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.011	Section 22.4.3, 22-7	MBr		LEGACY Comment HSR18.058 - 22.4.3 Station Deluge System - An under-vehicle water spray system - highspeed trainsets will have under vehicle / bottom covers for aerodynamics purposes and EMU will be of a bi level design which will have very low floor pans and will have the major traction systems inside the car this under vehicle approach needs to be evaluated for its' limited effectiveness.	02/28/22	MJS	B	Under-vehicle deluge system will accommodate Caltrain EMU per Caltrain PCEP criteria.				05/17/22	MM	The responder (PMPC Team) has confirmed that the criteria is compliant with operator criteria; therefore this comment is considered closed.	05/17/22	CC
TA.001	Section 15.2, Emergency Management	LZ	07/04/22	States "Local control will also be provided for certain emergency management functions." very vague statement. functions that need local control have to be specified	09/20/22	NS	A	revise statement as follows: Local control shall be provided such that incident command (fire department) arriving at the incident can over-ride remote control and can control emergency response provisions as follows: Emergency Ventilation System, Fire Detection and Alarm System, Public Address System Standpipe System.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.002	Section 15.2, Emergency Management	LZ	07/04/22	The list of systems does not have CCTV	09/13/22	MJS	A	Revised as noted.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.003	Section 15.2.1, Ventilation System Monitoring and Control	LZ	07/04/22	This section implies that there will be work at the Caltrain CCF by/for the DTX. Is this in the DTX scope/budget?	09/20/22	MJS	C	The interfacing capabilities of Caltrain are not currently captured explicitly in the scope/budget of the DTX project but are accounted for in contingencies. The precise interface requirements and scope will need to be determined and agreed upon between TJPA and the operators during the next phase of design.				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation on original comment and will agree to carry this concept onto the next phase of design for interface management; therefore this comment is considered closed.	10/07/22	CC
TA.004	Section 15.3.2.2, Automatic Fire Detection Devices	LZ	07/04/22	The list of locations where fire detection devices must be installed does not include STC. Were they installed in phase 1?	09/14/22	MM	A	Revised as noted.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.005	Section 15.3.2.3, Manual Fire Alarm Pull Stations	LZ	07/04/22	States that manual fire pull stations are to be located in the free areas of stations. How about paid areas?	09/20/22	NS	A	Revised as noted.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.006	Section 15.3.2.3, Manual Fire Alarm Pull Stations	LZ	07/04/22	Mentions what happens with the escalators when an alarm is activated, but does not have the same for elevators	09/20/22	NS	A	Added the following paragraph: "All elevators in the station must automatically go to a pre-determined floor within 90 seconds after activation of the manual pull station. The elevators must be coordinated with the fire department to allow override control. Station platforms must have emergency waiting area(s) for mobility-impaired passengers to wait for fire department to assist with evacuation. The designer must demonstrate tenability of emergency waiting area(s) for a period no less than the required time of tenability as determined by the fire department."				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.007	Section 15.7.1, Walkways	LZ	07/04/22	Specifies walkways 400 ft apart. Is three in the whole station adequate?	09/20/22	MJS	C	400 feet separation of walkways is sufficient because each platform must have emergency egress/exiting to meet NFPA requirements (4-min to clear from furthest point). There should be no need for passengers at platform level to cross tracks to evacuate in the event of an emergency.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC
TA.008	Section 15.8, Fourth and Townsend Street Station	LZ	07/04/22	Should have the same subsections as the STC section	09/14/22	MM	A	Revised title of section 15.8 to "Underground Stations". Added "Salesforce Transit Center Station" to first sentence.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 50
Comments Closed 50
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 16, Mechanical Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
John Bumanis (Design Team/Parsons)	JB	Elena Lasheras (CHSRA)	EL
M. Brunner (CHSRA)	MBr	Bin Zhang (Caltrain)	BZ
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Nader Shahcheraghi (PMPC SME/ AECOM)	NS

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	16.1.1	JB	04/21/22	1) Section 16.1.5.2 discusses by-pass dampers but does so in the context of temperature control and only if necessary (i.e. "Where necessary during normal operations, bypass shafts must allow air exchange between the outside ambient and the tunnel."). Since both stations will be mechanically ventilated during normal operations, additional by-pass dampers and shafts do not appear to be required to ensure air exchange between the outdoors and the stations. Please verify. 2) Also, there is no requirement in this paragraph or criteria chapter regarding the need for any blast or piston action relief shafts. Please verify that piston action relief is not necessary.	05/17/22	NS	DE	In addition to temperature control, relief shafts may be required to control pressure transients due to portal entry/exit or sudden expansion/contraction of tunnel cross sectional area. Alos, piston effect could cause excessive velocity in stations if piston effect is relieved only through the stations. So the designer should evaluate, using engineering analysis, the need for relief shafts based on these requirements, in addition to temperature control.	08/05/22	BCC	Doesn't address issue associated with requirement for air exchange through by-pass dampers.	10/06/22	MJS	What requirements for air exchange through by-pass dampers, other than those for temperature control and pressure transient control? Please elaborate. **CRM held with John B., Nader S., and Matt S. on 10/6/22** - Currently there is no bypass provisions at the DTX stations. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
GEC.002	16.1.2 - 3 rd paragraph	JB	04/21/22	It would be beneficial if the number and locations of stalled trains were defined. This would further clarify the requirement for the designer	05/17/22	NS	DE	Since the exact location of stalled trains cannot be determine apriori, the designer should determine the worst location among possible locations for design purposes.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	16.1.3	JB	04/21/22	This section essentially describes emergency ventilation operating in a longitudinal push-pull mode. Should also include discussion and description regarding the single point extract mode of operation.	05/17/22	NS	A	If single extract mode is anticipated in a particular location this content shall be added.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	16.1.4.3	JB	04/21/22	This section requires that the design train fire size and growth rate conform to the fire sizes indicated in the Transbay Program's Final Risk and Vulnerability Assessment. This may not be feasible with the current system. In addition, the fire heat release rates mandated by RVA criteria are higher than what is being used for the current SES/CFD task.	05/16/22	AK	A	The Final Risk and Vulnerability Assessment is being rebranded as the Threat and Vulnerability Assessment (TVA) and is currently in the process of being updated. The design train fire size and growth rate will be verified after the assessment is complete.	08/05/22	BCC	This topic requires further discussion	10/06/22	MJS	**CRM held with John B., Nader S., and Matt S. on 10/6/22** - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic and ensure consistency across all project documents (DTX DCM, TVA, designs, and models) as an action item during the next phase of design.	10/06/22	CC
GEC.005	16.2.2	JB	04/21/22	This section states that Fourth and Townsend Street Station must be naturally ventilated using the following requirements from San Francisco Municipal Transportation Agency's criteria for the Central Subway project: - The maximum temperature is 10 degrees above ambient temperature. - No heating is required. This conflicts with sections 16.2.2.1 and 16.2.4.1 that discuss heated and conditioned air. It is our understanding that requirements for heating and cooling have been eliminated.	05/17/22	MM	A	Edit has been made to note "where applicable" for the HVAC, the natural ventilation is listed for the Fourth and Townsend St. Station.	08/05/22	BCC	This topic requires further discussion - potential conflict still exists	10/06/22	MJS	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close address comment in section 16.2.2.1 and 16.2.4.1. Revised as noted.	10/06/22	CC
GEC.006	16.2.2.2, 16.2.2.3	JB	04/21/22	It's our understanding that the maximum air velocity in ducts, plenums and shafts serving the emergency tunnel ventilation system is 2500 feet per minute.	05/17/22	NS	A	Preferred maximum is 2000 fpm. 2500 fpm will be considered if site limit does not allow for 2000 fpm. Text has been updated accordingly.	08/05/22	BCC	This topic requires further discussion - text still refers to 2000 fpm maximum	10/06/22	MJS	2000 fpm is the **preferred** maximum when site conditions allow it. CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to modify criteria language - comment is considered closed.	10/06/22	CC
GEC.007	Chapter 23 - General	JB	10/01/18	LEGACY Comment GEC18.112 - A requirement for the "cold flow" simulations required in 2107 NFPA 130 paragraph 7.13 needs to be incorporated into this chapter.	04/06/22	NS	C	The project is required to be NFPA 130 compliant, therefore this requirement is implied.		ROK	Concur				05/16/22	CC
GEC.008	Paragraph 23.1.2	JB	10/01/18	LEGACY Comment GEC18.113 - 4th paragraph states that "In the event that congested conditions necessitate a passenger evacuation, the fan speed shall be set to maintain passenger comfort levels." Need to define comfort level temperature in the criteria.	04/06/22	NS	A	Fourth paragraph has been changed to the following, per SME Nader Shahcheraghi's direction: If congested conditions necessitate a passenger evacuation, this will be deemed an "emergency operation and the fan speed will be set to maintain a tenable environment per NFPA 130 conditions.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.009	Paragraph 23.1.4.2	JB	10/01/18	LEGACY Comment GEC18.114 - Clarify, specify the outdoor temperature (83 F or 103 F) corresponding to the 105F tunnel temperature.	04/06/22	MJS/NS	A	Maximum design outdoor temperature will assume 109*F accounting for climate change warming projections as stated in the California's Fourth Climate Change Assessment - San Francisco Bay Area Region Report". SME has approved this response.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.010	Paragraph 23.1.5.	JB	10/01/18	LEGACY Comment GEC18.115 - Unlike a fan located in a vent building, jet fans could be directly exposed to a fire. Add requirement for redundancy, (e.g. extra pair)	04/06/22	NS	C	The project is required to be NFPA 130 compliant, therefore fan redundancy is implied. The jet fan(s) directly exposed to tunnel fire incident must be assumed to be out of service and additional jet fan(s) must be provided to back up the operating jet fan(s).		ROK	Concur				05/16/22	CC
GEC.011	Paragraph 23.4.2 Floor and Area Drains – 3rd paragraph	JB	10/01/18	LEGACY Comment GEC18.116 - Note that drains located in both elevator and escalator pits should be equipped with an oil/water separator to prevent contaminating the track drain and the city sewer. The AHJ may also have requirements regarding draining elevator pits that should be referenced here.	04/06/22	NS	A	No objection to the oil/water separator provision in elevator/escalator pits to control contamination of drainage system. This type of drainage should be sent to sanitary sewer system.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.012	General	JB	10/11/21	LEGACY Comment PMPC.002 - Cooling Variance - see email from John Bumanis dated 10/11/2021	04/06/22	MJS	A	Station ventilation has been addressed per John Bumanis' 10/11/21 email	05/18/22	ROK	Concur	05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
GEC.013	Chapter 22/23-General	JB	10/01/18	LEGACY Comment GEC18.108 - Per NFPA 130 paragraph 7.2.6.1 "The criteria for tenability and time of tenability for stations and trainways shall be established and approved." Tenability criteria and time requirements need to be developed and incorporated into the criteria.	04/06/22	NS	A	NFPA 130 provides guidance on tenability criteria in section B.3. Required time of tenability shall be developed for each station based on input from fire department and first responders as well as for developing the Emergency Response Plan.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
GEC.014	16.1.3 Emergency Operations	CU	07/01/22	Cite NFPA 130 requirements for cooridnation with signal system	09/20/22	NS	A	NFPA 130, 2020 section: 7.2.5* The design and operation of the signaling system, trac- tion power blocks, and ventilation system shall be coordinated to match the total number of trains that could be between ventilation shafts during an emergency.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.015	16.1.6.2	JB	06/23/22	1) Section 16.1.6.2 discusses by-pass dampers but does so in the context of temperature control and only if necessary (i.e. "Where necessary during normal operations, bypass shafts must allow air exchange between the outside ambient and the tunnel."). Since both stations will be mechanically ventilated during normal operations, additional by pass dampers and shafts do not appear to be required to ensure air exchange between the outdoors and the stations. Please verify. 2) Also, there is no requirement in this paragraph or criteria chapter regarding the need for any blast or piston action relief shafts. Please verify that piston action relief is not necessary.	09/20/22	NS	C	Piston action relief is necessary. Please see PMPC response dated 05/17/22 to item GEC.001				10/06/22	MJS	What requirements for air exchange through by-pass dampers, other than those for temperature control and pressure transient control? Please elaborate. **CRM held with John B., Nader S., and Matt S. on 10/6/22** - Currently there is no bypass provisions at the DTX stations. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 50
Comments Closed 50
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 16, Mechanical Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
John Bumanis (Design Team/Parsons)	JB	Elena Lasheras (CHSRA)	EL
M. Brunner (CHSRA)	MBr	Bin Zhang (Caltrain)	BZ
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Nader Shahcheraghi (PMPC SME/ AECOM)	NS

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.016	16.2.2	JB	06/23/22	This section states that Fourth and Townsend Street Station must be naturally ventilated using the following requirements from San Francisco Municipal Transportation Agency's criteria for the Central Subway project: - The maximum temperature is 10 degrees above ambient temperature. - No heating is required. This conflicts with sections 16.2.2.1 and 16.2.4.1 that discuss heated and conditioned air. It is our understanding that requirements for heating and cooling have been eliminated.	09/20/22	NS	A	The terms' heated and conditioned air' will be changed to 'naturally ventilated.'			CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close address comment in section 16.2.2.1 and 16.2.4.1. Revised as noted.	10/06/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/06/22	CC
HSR.001	Chapter 23 - Mechanical Systems; Section 16.4 (Drainage Systems) (Page 32 of 34)	EL	04/28/22	Please incorporate the following requirements in this section: - Tunnel track drainage system shall effectively collect and remove water from the tunnel resulting from condensation, groundwater leakage, rain entering the tunnel, spilled water, fire-fighting activities, cleaning, and other sources. - Runoff from outside the tunnels shall be prevented from entering the tunnel. - Drainage for tunnel track section shall be accommodated in a trough with cover or pipe in the center of the trackway tunnel slab based on a gravity drainage system. - Critical facilities, such as traction electrification system, automatic train control, communications, portal sites and facilities, vent structures, traction power supply sites, operations control centers, etc. shall be designed so that the finish floor elevation or top of slab foundation of these facilities are a minimum of 2 feet above 100-year floodplain or six inches above 500-year floodplain, whichever is greater.	05/17/22	NS	A	Track drainage shall be per NFPA 502 section 7.12 and additional requirements listed here shall be added to supplement the track drainage requirements.	06/24/22	ROK		06/24/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	06/24/22	CC
HSR.002	Chapter 23 - Mechanical Systems; Subsection 23.1.1.14 (Inlets and Piping) (Page 33 of 34)	EL	04/28/22	Per CHSRA Design Criteria Manual Rev. 5.0, the minimum diameter of the track drainage system shall be 12 inches.	05/17/22	NS	A	Noted.	06/24/22	ROK		06/24/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	06/24/22	CC
HSR.003	Chapter 23 - Mechanical Systems; Subsection 23.1.1.14 (Inlets and Piping) (Page 33 of 34)	EL	04/28/22	Recommend not limiting track drain pipe materials to fiberglass.	05/17/22	NS	DE	No objection the request. Designer to evaluate	06/24/22	ROK		06/24/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	06/24/22	CC
HSR.004	Section 23.1.2, 23-6	MBr	10/01/18	LEGACY Comment HSR18.059 - 23.1.2 Congested Operations - ceiling heights should be known? See below 23.2.3.1	04/06/22	NS	A	The ceiling height will be determined by the architectural and structural designers. However, sufficient air temperature should be maintained to ensure wayside equipment such as train air conditioning system and condenser units can function during congested operations.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.005	Section 23.1.3, 23-6	MBr	10/01/18	LEGACY Comment HSR18.060 - 23.1.3 Emergency Operations - will any fire suppression / extinguishing systems be available in the tunnels?	04/06/22	NS	A	A standpipe system will be provided in the tunnels per NFPA 14 requirements.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.006	Section 23.1.4.2, 23-3	MBr	10/01/18	LEGACY Comment HSR18.061 - 23.1.4.2 Indoor Design Conditions -No control of air velocity shall be provided during off-service hours. Please provide ventilation for circulation of air during off-service hours, as trainsets will likely be stored at Transbay.	04/06/22	MJS	B	According to DTX Design Criteria Chapter 02 - Owner's Requirements "..the design must assume a 24-hour-per-day operation." It is not known at this time if trainsets will be stored at the transit center. The turnback track allows train movements during off-peak between the DTX and the Fourth and King Railyard for train storage.				05/17/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.007	Section 23.2.3.1, 23-12	MBr	10/01/18	LEGACY Comment HSR18.062 - 23.2.3.1 Air at platform ceiling level - Each 200 meter trainset will be consuming approximately 240 kW during lay over periods and an energy consumption as high as 640 kW plus heat being dissipated from traction heat exchangers when entering the station area during revenue service. Provide details on ceiling heights.	04/06/22	NS/MJS	A	"The ceiling heights will be determined by the structural/architectural design. See comment response to HSR18.059 for addressing tempering of the air temperature." Fourth and Townsend Street Station: CHSRA platform to ceiling: 17.33' Caltrain platform to ceiling: 19.42' TOR to ceiling: 21.25' Salesforce Transit Center Station: *Final architectural fit-out details have not been finalized including potential drop ceiling CHSRA platform to ceiling: approx. 19.28' Caltrain platform to ceiling: approx. 21.58' TOR to ceiling: approx. 23.5'							05/17/22	CC
HSR.008	Section 23.3.1.1, 23-25	MBr	10/01/18	LEGACY Comment HSR18.063 - 23.3.1.1 Potable cold water should be provided at station platform track areas	04/06/22	NS	A	Designers should refer to California Plumbing Code / Mechanical Code for potable cold water requirements at station platforms.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.009	Section 23.3.1.3, 23-26	MBr	10/01/18	LEGACY Comment HSR18.064 - 23.3.1.3 Soil and Waste system - access for unscheduled on board waste holding tanks servicing shall be provided	04/06/22	NS	A	Designers should refer to California Plumbing Code / Mechanical Code for soil and waste system servicing requirements.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.010	Section 23.3.1.5, 23-26	MBr	10/01/18	LEGACY Comment HSR18.065 - 23.3.1.5 Compressed air system - compressed air shall be made available on station platforms tracks	05/19/22	MM	C	The compressed air system is being provided for the emergency ventilation system. No requirements were found in either Caltrain or CHSRA design criteria for compressed at station platform tracks.							05/19/22	CC
HSR.011	Section 23.4.1.2, 23-31	MBr	10/01/18	LEGACY Comment HSR18.066 - 23.4.1.2 Sump Pits & 23.4.2.2 - Cleanout shall be designed and sized to accommodate the introduction of sand from trainset's / EMU's emergency brake system.	05/19/22	MM	C	A requirement for sand traps is included in Section 23.4.1.2 Sump Pits. Section 23.4.2.2 Cleanout is for floor drains in the stations where sand should not reach.							05/18/22	CC
HSR.012	Section 23.4.2, 23-31	MBr	10/01/18	LEGACY Comment HSR18.067 - 23.4.2 Floor and area drains - station platforms areas shall be designed to drain HVAC condensation water.	04/06/22	NS	C	HVAC condensation is typically collected and conveyed by HVAC plumbing system and can be directed to station drainage system. Station platform area drains are typically sized per station cleaning/washing. If the platform is sprinklered the design condition for the drainage system is based sprinkler discharge rate, as determined by system designer.							05/17/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 50
Comments Closed 50
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 16, Mechanical Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
John Bumanis (Design Team/Parsons)	JB	Elena Lasheras (CHSRA)	EL
M. Brunner (CHSRA)	MBr	Bin Zhang (Caltrain)	BZ
Joel Pancoast (Caltrain)	JP	Luis Zurinaga (SF CTA)	LZ
Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Nader Shahcheraghi (PMPC SME/ AECOM)	NS

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
BCC – Back-check comment

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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
Cal.001	Chapter 16	JP	04/29/22	reconcile chapter number with section 1.6 Design Criteria Organization; renumber chapter subsection accordingly	05/13/22	AK	A	Chapter numbering will be coordinated during production.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Chapter 16.2.6.12	JP	04/29/22	include; essential service	05/17/22	MM	C	Fire/life/safety systems are already included in the list. Note that comprehensive seismic requirements are included in Ch. 10.							05/17/22	CC
Cal.003	Chapter 16.2.6.12	JP	04/29/22	include; using an importance factor (Ip) of 1.5	05/17/22	NS	A	No objection the request. Designer to evaluate				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
Cal.004	Chapter 16.2.6.12	JP	04/29/22	include; Non-essential mechanical systems in conformance with the seismic provisions of the CBC may be designed using an importance factor (Ip) of 1.0	05/17/22	NS	A	No objection the request. Designer to evaluate				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
Cal.005	Chapter 16.1.3	BZ	04/29/22	Ventilation system design for emergency operations should be reviewed by an independent peer.	05/17/22	NS	A	Emergency Ventilation System shall be reviewed by PMPC Subject Matter Expert.				05/17/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
Cal.006	Chapter 16 Section 16.1.5.3; (Page 16-4 of 34)	JP	06/30/22	Include with NFPA 130 section 7.2.2 Single Point Extraction	09/20/22	NS	A	Revised as noted.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
Cal.007	Chapter 16 Section 16.1.5.3; (Page 16-4 of 34)	JP	06/30/22	Provide sub-section number for 'Design Air Velocities' following Evacuation Route Air Velocity paragraph	09/20/22	MJS	C	The PMPC Team (and TJPA) have developed a project document template that only allows 4 levels of numbering. Subheaders have been created to distinguish between subtopics. No change required.				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/07/22	CC
TA.001	Section 16.1.3, Emergency Operations	LZ	07/04/22	States that emergency operations are triggered by fire, but there are many other scenarios for emergencies, such as derailment, terrorist activities, accidents, etc	09/20/22	NS	A	Revised section 16.1.3 - Fire Emergency Operations and modified language within. All non-fire emergencies will operate under maintenance and train recovery operations.				10/06/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/06/22	CC
TA.002	Section 16.1.4, Maintenance and Train Recovery Operations	LZ	07/04/22	Mentions that maintenance operations will be by diesel powered equipment. Should consider battery operated or hybrid	09/13/22	MM	C	At this time, Caltrain has informed TJPA that they plan to continue use of their current maintenance equipment which is diesel. As noted, diesel is a less clean source so this is a conservative approach. If Caltrain changes position in the future, the design criteria can be updated.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA accepts PMPC response. Ventilation system must handle deisel exhaust caused by maintenance vehicles to maintain safe/clean air within underground structures.	10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/07/22	CC
TA.003	Section 16.1.5.3 (Exhaust Air At Sidewalk Level)	LZ	07/04/22	Implies that there will be exhausts at sidewalk gratings. I thought they were no longer allowed	09/14/22	MM	A	Agree. Section to be deleted.				10/06/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/06/22	CC
TA.004	Section 16.1.6.1, Fans (Axial Flow Fans, second to last bullet)	LZ	07/04/22	Rephrase sentence	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.005	Section 16.1.6.1, Fans (Axial Flow Fans, last sentece before "Jet Fans" subsection)	LZ	07/04/22	States "Do not include provisions for stand-by fans". Explain why	09/20/22	NS	A	Sentence deleted.				10/06/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/06/22	CC
TA.006	Section 16.1.6.6 (first bullet)	LZ	07/04/22	Specifies 50 lb maximum force for opening the doors. Is that adequate for most people?	09/20/22	NS	C	This is NFPA 130 requirement. It assumes that person(s) with this ability will be among the evacuees.				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/07/22	CC
TA.007	Section 16.1.6.6 (last bullet)	LZ	07/04/22	Add "and the STC control center". All functions that happen within the center must have the ability to be monitored at the STC in addition to the CCF	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.008	Section 16.2.6.4, Flexible Duct Connectors	LZ	07/04/22	State the acceptable materials for flexible duct connectors	09/20/22	NS	C	Industry standard is that specific materials shall be selected by the designer based on available products in the market.				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/07/22	CC
TA.009	Section 16.3.1, Functional Requirements (first para)	LZ	07/04/22	Add "plumbing system will also collect, convey and dispose of water infiltration at all underground structures"	09/20/22	NS	B	Added the following sentence: "The plumbing system must also collect, convey and dispose of infiltrated water in underground structures, independent from the tunnel drainage system (see Section 16.4.1)."				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/07/22	CC
TA.010	Section, 16.3.1.2 (second para)	LZ	07/04/22	Why tank heaters? instant water heaters are more efficient	09/20/22	NS	A	Tankless water heaters will be added to the choices so the desiger can use this type if appropriate.				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.011	Section 16.3.2.5, Pipe Supports, Hangers, Guides and Anchors	LZ	07/04/22	Include provisions for water hammer where necessary	09/20/22	NS	A	Revised sentence to read as follows: "Consider the forces caused by the weight and motion of the fluid, water hammer forces, the weights of piping, valves and insulation, and thermal expansion and contraction in the design, as appropriate. "				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.012	Section 16.3.3.1, Fixtures	LZ	07/04/22	Specify type of flush valves to be used. Suggest automatic	09/20/22	NS	A	Revised as noted				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.013	Section 16.4.1, Tunnel Drainage Systems	LZ	07/04/22	Add "drainage system will be designed to efficiently collect and remove all water infiltration resulting from a failure of the structures' waterproofing."	09/20/22	NS	A	(NADER, Please let me know if we need to get our tunnel and/or structural SME involved with this conversation ASAP) NS: Yes, we need to discuss with tunnel and structural team to determine the water quantity in case of waterproofing failure. (NLV) Invariably, leakage will occur - structures chapter includes intrusion flow rate - see TABLES 12.3 & 13.1				10/07/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/07/22	CC
TA.014	Section 12.9, Watertightness and Leakage Mitigation	LZ	07/04/22	Although designing for watertightness, design should provide for collection and removal of any water infiltration due to failure of the waterproofing	10/01/22	MJS	A	Drainage and Plumbing system requirements in Chapter 16, Mechanical Systems is referenced and requires collection, conveyance, and removal of infiltrated water.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC
TA.015	Section 12.10, Drainage	LZ	07/04/22	Drainage system must be design to handle water infiltration over and above the allowable infiltration rates	10/01/22	MJS	A	Drainage and Plumbing system requirements in Chapter 16, Mechanical Systems is referenced and requires collection, conveyance, and removal of infiltrated water.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the approach	10/11/22	MJS	The responder (PMPC Team) met with commentor for a CRM on 10/11 and agreed to PMPC response; therefore this comment is considered closed.	10/11/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 14
Comments Closed 14
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 17, Electrical Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Lindsay Yamane (Design Team)	LY	Joel Pancoast (Caltrain)	JP
Bin Zhang (Caltrain)	BZ	M. Brunner (CHSRA)	MBr
Luis Zurinaga (SF CTA)	LZ		
Responders			
Amanda Kaku (PMPC/HCI)	AK	Meghan Murphy (PMPC/AECOM)	MM
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Raymond Walsh (PMPC SME/Mott MacDonald)	RW

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	17.6	LY	08/03/22	Section 17.6 Disconnect Switches has an extra linespace between frist and second line of text.	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.001	Chapter 17	JP	04/29/22	reconcile chapter number with section 1.6 Design Criteria Organization; renumber chapter subsection accordingly	05/13/22	AK	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.002	Chapter 17.4.1.1	JP	04/29/22	insert; Illumination of emergency lighting shall conform to section 17.4.1.6.	05/13/22	AK	A	Will comply.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.003	Section 24.4	DK	10/18/18	LEGACY Comment Cal18.050 - Section 24.4 (general) Update to the whole lighting section for new lighting technology developed since 2009.	04/06/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Chapter 3, Section 3 (pps 3-35] and the Caltrain PCEP Design Criteria	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.004	Section 24.4.1.1 Table 24.1	BZ	10/18/18	LEGACY Comment Cal18.051 - Table 24.1, Illumination Levels Need an Emergency Lighting level.	04/06/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Chapter 3, Section 3 (pps 3-35, Table 3-2]: "Emergency lighting: aerial (pedestrian overpass), underpasses, stairways, escalators, and elevators - 2-foot candles - minimum."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
Cal.005	Section 24.4.3.2	BZ	10/18/18	LEGACY Comment Cal18.052 - Section 24.4.3.2 Lamp Types Why not use LED lamps for lighting?	04/06/22	MJS	A	PMPC Team will update criteria consistent with Caltrain Design Criteria (Third Edition), dated August 31, 2020 [Chapter 3, Section 3 (pps 3-35]:	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.001	Section 24.1.2, 24-2	MBr	10/01/18	LEGACY Comment HSR18.068 - 24.1.2 - HEP wayside to onboard 480v three phase receptacles, cables and control panel	04/06/22	MJS	A	Revised as noted	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.002	Section 24.2.2, 24-4	MBr	10/01/18	LEGACY Comment HSR18.069 - 24.2.2 Emergency power - Provide space for wayside to onboard communication systems and repeaters (if required)	04/06/22	AG	A	Added last paragraph: "Provide space for wayside to onboard communication systems and repeaters (if required)."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.003	Section 24.4, 24-11	MBr	10/01/18	LEGACY Comment HSR18.070 - 24.4 Lighting - Blue Flag protection lights should be added in station platforms track areas to comply with CFR 49 Part 218	04/06/22	MJS	A	Blue Flag protection lights would need to match Caltrain PCEP Design Criteria	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.004	Section 24.4, 24-11	MBr	10/01/18	LEGACY Comment HSR18.071 - 24.4. Lighting - in addition lights should be added to indicate OCS energized & de-energized at station platform track area.	04/06/22	MJS	C	OCS energized indication lights (if required) would need to match Caltrain PCEP Design Criteria - there are no such requirements in the PCEP DCM beyond the following: . The Right of Way does feature line energized warning signage for safety purposes, typically mounted at intervals on the OCS poles. NOTE that this type of indicator type light is typically mounted on TPSS DC Switchgear - at Traction Power Sub Station.							05/24/22	CC
TA.001	Section 17.2.2.1, Emergency Generators	LZ	07/04/22	States: "Generators must be located at street level where possible" Generator in the train box extension is below ground. Even though above ground is possible, it is undesirable. Need to add section for below ground generators	09/14/22	RW	DE	Subsurface generator requirements will be provided during next phase of design				10/04/22	MJS	The responder (PMPC Team) has agreed to incorporate subsurface generator requirements during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
TA.002	Section 17.5, Equipment Location	LZ	07/04/22	Mentions 20% spares for electrical equipment, but where are the provisions for storing spares?	09/14/22	RW	A	Will revise to "Lighting and Power electrical panels must include 20% minimum space circuit breaker quantity."				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.003	Section 17.7.1.3, Public Telehone Power Supply	LZ	07/04/22	Mentions power supply for public phones, but public phones are not mentioned anywhere else in the document	09/14/22	RW	A	Subsection 17.7.1.3, Public Telephone Power Supply removed/deleted.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.004	Section 17.11, Load Flow Analysis (Fourth para, first sentence)	LZ	07/04/22	Replace" toleration" with "tolerances"	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 47
Comments Closed 47
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 18, Rail Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Steve Adkins (Design Team/Parsons)	SRA	E. Mortlock (Design Team/Parsons)	EM
Andrew Clapham (CHSRA)	AC	Philip Gilmour (CHSRA)	PG
X. Banko (CHSRA)	XB	M. Brunner (MBr)	MBr
Rusty Dudley (Caltrain)	RD	Uhila Makoni (Caltrain)	UM
Rick Bartholomew (Caltrain)	RB	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
GEC.001	18	SRA	04/25/22	Recommend including requirements for how the disconnect switches are monitored and controlled.	05/18/22	MJS	A	Added new section18.2.7.1 Disconnect Switches: "Disconnect switches must conform to Caltrain PCEP Design Criteria. The OCS will be equipped with disconnect switches at all primary feeding and bypass feeding locations and monitored by supervisory control and data acquisition system (SCADA), refer to Chapter 19, Communications. All disconnect switches must be motor operated, capable of remote operation and of local motorized or manual operation."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.002	18	SRA	04/25/22	Recommend including requirements for the type of OCS disconnect switch (i.e. manual, motorized, no-load, load break).	05/18/22	MJS	A	Added new section18.2.7.1 Disconnect Switches: "Disconnect switches must conform to Caltrain PCEP Design Criteria. The OCS will be equipped with disconnect switches at all primary feeding and bypass feeding locations and monitored by supervisory control and data acquisition system (SCADA), refer to Chapter 19, Communications. All disconnect switches must be motor operated, capable of remote operation and of local motorized or manual operation."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.003	18 - Scope	SRA	04/25/22	It is not clear why there is two paragraphs with details about the voice and train control, but not for other Rail Systems disciplines. It seems out of place.	05/18/22	MJS	A	Revised as noted, content moved to section 18.6 - Signals and Train Control				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.004	18.1 Design Requirements	SRA	04/25/22	If the only design requirements are for the OCS then why not include under the OCS section.	05/18/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.005	18	SRA	04/25/22	General comment: Update chapter references and table numbers	05/18/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.006	18.1.1	SRA	04/25/22	Even though there is a general reference to the PCEP design criteria above, I would include a reference specific to environmental conditions for the at-grade OCS.	05/18/22	MJS	C	Section 18.1.1 already references DTX Design Criteria Chapter 4, Environmental Requirements where this information is described in greater detail. No need to repeat here. Also, PCEP design criteria is referenced.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.007	18.2.4 OCS and NF Wires	SRA	04/25/22	Recommend spelling out Negative Feeder since NF is not defined elsewhere	05/18/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.008	18.2.4 OCS and NF Wires	SRA	04/25/22	Wire sizes should be updated to the sizes/types included in the design drawings recently provided by Caltrain.	05/18/22	MJS	A	Section deleted, new section created under 18.3 Overhead Contact System - "18.3.1 OCS Wire Particulars" stating the following: "All wires and cables associated with the DTX OCS must match those used for the Caltrain PCEP. Refer to the Caltrain PCEP Design Criteria and OCS Basic Design Assemblies Tunnel – Overhead Bridge drawing W6001."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.009	18.2.4 OCS and NF Wires	SRA	04/25/22	States to assume bare wire throughout the system. However, portions of the tunnel may require insulated. What are the Caltrain requirements?	05/18/22	MJS	A	See response to comment #GEC.008				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.010	18.3 Overhead Contact System	SRA	04/25/22	Which version of the PCEP Design criteria? 2016 version is not up to date and currently being updated.	05/18/22	MJS	C	The 2016 PCEP Design Criteria is the latest version available. A revision of the PCEP Design Criteria is expected in 8-10 months, at which point the DTX Design Criteria will be updated to reflect.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.011	18.3.2 Foundations	SRA	04/25/22	Recommend including a requirement for the Geotech report in Chapter 9 include an OCS specific section providing lateral soil bearing pressure for OCS foundation design.	05/18/22	MJS	DE	Need to coordinate with Martin Walker to verify if this should be a consideration	08/05/22	BCC	The recommendation to include and OCS-specific section providing lateral soil bearing pressure for OCS foundtation design and other geotechnical requirements in Geotechnical Report(s) in - Chapter 9, Geotechnical requirements was not found.	10/04/22	MJS	See PMPC Additional Response/Next Steps response to comment #GEC.021. The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.012	18.3.3 Clearances	SRA	04/25/22	This requirement was specific to OCS structures. By removing "OCS foundation, pole and structure" it becomes a general OCS clearance requirement and loses the original intent of the requirement.	05/18/22	MJS	A	Revised as follows: "Horizontal and vertical clearances must conform to the requirements of Section 7.3 and will also satisfy CPUC general order 26-D."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.013	18.3.6.1 OCS Type	SRA	04/25/22	Include a specific PCEP reference to the OCS type to be used in the at-grade section.	05/18/22	MJS	A	Revised first sentence to read as follows: "The OCS for the at-grade portion of the DTX must be a simple catenary (messenger and contact wire), automatic tension (A.T.) system and conform to the Caltrain PCEP Design Criteria."				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.014	18.3.6.4 Overlaps, Turnouts…	SRA	04/25/22	Change "air-break" to "section insulator." Air-break is also used to refer to an alternate overlap where the contact wires go in and out of running, but do not terminate.	05/18/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.015	Chapter 17	EM	10/01/18	LEGACY Comment GEC18.097 - Third paragraph under Scope; modify to read: "Caltrain is implementing a program to electrify its Peninsula Corridor Service and is also implementing a Positive Train Control (PTC) upgrade of its Signal and Train Control system.	04/06/22	MJS	A	The following DTX Design Criteria Revision Book 01 chapters have been consolidated into new (Rev. Book 02) Chapter 18 - Rail Systems. Chapter 14 - Traction Power Supply and Distribution, Chapter 15 - Voice and Train Control Communications, and Chapter 17 - Signals and Train Control. The content of "Scope" under this new chapter now references the Caltrain PCEP Design Criteria as primary source.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.016	Chapter 17	EM	10/01/18	LEGACY Comment GEC18.098 - Fourth paragraph under Scope; modify the sentence by adding: "and as modified by Caltrain's Electrification Program'.	04/06/22	MJS	A	See comment response GEC18.097.		PAR		8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
GEC.017	18-1 Codes and Standards	CU	07/05/22	GO-95 title it "Rules for Overhead Electric Line Construction"	09/13/22	MJS	A	Editorial: Will update references globally Did search. This is the only place it is titled				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.018	18.2.1 Design Requirements	SRA	08/03/22	Subsection numbers in the first sentence need updated.	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.019	18.2.2 OCS Wire Particulars	SRA	08/03/22	Drawing W6001 title is "ELECTRIFICATION PROJECT OVERHEAD CONTACT SYSTEM CATENARY WIRES." Overhead Bridge is not included in the drawing package title.	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.020	18.2.6 Electrical Clearances	SRA	08/03/22	The sentence about Absolute Minimum Clearances should be removed since this has been removed from the table.	09/13/22	MJS	A	Revised as follows: "The absolute minimumelectrical clearances, as shown, may only be adopted with the approval of the TJPA and must be achieved maintained at all times consistently under all defined climatic conditions."				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

Transbay Program
Downtown Rail Extension (DTX)
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Comments Closed 47
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 18, Rail Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Steve Adkins (Design Team/Parsons)	SRA	E. Mortlock (Design Team/Parsons)	EM
Andrew Clapham (CHSRA)	AC	Philip Gilmour (CHSRA)	PG
X. Banko (CHSRA)	XB	M. Brunner (MBr)	MBr
Rusty Dudley (Caltrain)	RD	Uhila Makoni (Caltrain)	UM
Rick Bartholomew (Caltrain)	RB	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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GEC.021	18.2.4 Foundations	SRA	08/03/22	I am not finding comment GEC.011 incorporated in Chapter 9.	10/06/22	MJS	A	Revised section 9.2 - Geotechnical Reporting, under subheading "Geotechnical Interpretive Report (GIR)" to include: "settlementsDeep and shallow foundation design for vertical and lateral loading as well as estimates of settlements for all structures including the tunnel and ancillary items like overhead contact system poles, equipment pads, and operations and maintenance facilities"				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.022	18.3 Voice Radio	LY	08/03/22	First paragraph references "subsection 18.7.1" which does not exist	09/13/22	MJS	A	Revised as follows: "Due to the fact that the tunnel alignment includes multiple horizontal curves, radiating coaxial cable must be used in the DTX tunnel instead of tunnel radios. Requirements for the radiatingThe design and implementation of radiating coaxial cable are in subsection 18.7.1.must conform to the Caltrain PCEP Design Criteria."				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
HSR.001	Chapter 14	PG	04/26/2022	No reference is made to the Rail Systems being coordinated with Caltrain and CAHSR infrastructure. Systems such as signaling, traction power and train control must be interoperable.	05/18/22	MJS	A	Revised to add the following: "The design of DTX rail systems must be coordinated with Caltrain and California High-Speed Rail Authority (CHSRA) infrastructure. Signaling, traction power, and train control must be interoperable and fully integrated with Caltrain PCEP corridor. "				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.002	Chapter 14 - 18.2.2	PG	04/26/2022	Load flow analysis must take into account Caltrain and CAHSR services under both normal and degraded situations.	05/18/22	MJS	A	Revised to read as follows: "The DTX design, through a series of traction power load-flow and power supply calculations, must determine whether PS-1 can provide sufficient traction power to the DTX project. Load flow analyses must consider Caltrain and CHSRA operations under both normal and degraded conditions."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.003	Chapter 14 - 18.3.4	PG	04/26/2022	Electrical clearances are not in line with CAHSR minimum electrical clearances. Please advise why CAHSR clearances cannot be achieved.	05/18/22	MJS	C	High-Speed Rail design criteria states (11.2.3 Electrical Clearances): "Electrical clearances from any live element of the OCS to any surrounding infrastructure shall be greater than 2 feet (600 millimeters) under all conditions." Electrical clearance of 2 feet cannot be achieved in the transit center and throat structure (see CHSRA DVR_0011) where 21'-6" TOR to BOS has been approved. Minimum System height is 18". Minimum CW height is 18'-9". That leaves a maximum possible electrical clearance of 1.25' (1'-3"). AREMA minimum passing clearance is 10.5"							05/25/22	CC
HSR.004	Chapter 18; General Comment - Train Control / Signaling	AC	04/22/22	Which signal principles is the DTX infrastructure being designed to - the Caltrain Route Signal rules, the Caltrain San Francisco Rules or the Speed Signal Rules (CTX)? A reference to this should be included within a suitable section of the DCM	05/18/22	MJS	DE	Caltrain San Francisco rules would govern, followed by Caltrain Route Signal rules. The governing signal principles will be included in the next revision of the DTX Design Criteria.				05/18/22	MJS	The next iteration of the DTX Design Criteria will include a reference to the governing signal principle.	05/25/22	CC
HSR.005	Chapter 18; General Comment - Train Control / Signaling	AC	04/22/22	There is no reference to any control center automation / traffic management functionality/equipment required as part of the DTX project - how will the live operational data on the DTX be relayed to the wider Caltrain/HSR network to enforce the timetable and manage perturbations?	05/18/22	MJS	C	DTX Train control systems will be connected to the Caltrain fiber backbone and routed to the Caltrain CCF/BCCF which serves as a node to HSR. Specific requirements of the signals communications interface between HSR and Caltrain are subject to PCEP final design.							05/25/22	CC
HSR.006	Chapter 18; General Comment - Train Control / Signaling	AC	04/22/22	It is not clear within the DCM whether it is the expectation that CBOSS PTC will be deployed on the DTX infrastructure by the contractor. This should be made clear.	05/18/22	MJS	A	See comment #Cal.002, 004. Section 18.7 has been revised to include the following: "The DTX PTC must be fully integrated with Caltrain's existing PTC system."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.007	Chapter 18; General Comment - Train Control / Signaling	AC	04/22/22	Has consideration been given to a broader harmonization of the train control system with the CHSRP project? There doesn't appear to be any explicit requirements within the DCM for incorporating HSR design requirements or constraints to allow HSR services to run on the DTX from a train control perspective.	05/19/22	MM	C	Integration of train control systems between CHSRA and Caltrain is being addressed at the State level. We are tracking the progress of this coordination between the operators via the project Issue Log. For the purposes of the current design and criteria, CHSRA has directed TJPA to use Caltrain's signaling system. The design criteria will be updated when further information is available on the systems requirements.							05/19/22	CC
HSR.008	Chapter 18, Rail Systems Scope	AC	04/22/22	The paragraph about bi-directional communications to the California High Speed Rail Control center should include reference to the sharing of operational data to ensure performance metrics (punctuality/timetable adherence) are met across the blended network - this will be required to facilitate delay attributions amongst owners/operators in the event of perturbation	05/18/22	MJS	A	Added the following sentence: "Operational data will be shared to ensure performance metrics such as punctuality and timetable adherence are met across the blended network to facilitate delay attributions amongst owners and operators in the event of service perturbation."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.009	Chapter 18, 18.6 Signals and Train Control - Traction Current Return	AC	04/22/22	The first 3 paragraphs do not relate to traction current return so should be removed from this section	05/18/22	MJS	A	Section 18.6 revised to following. 18.6 Signals and Train Control (includes first three paragraphs), 18.6.1 Traction Current Return, and 18.6.2 Tunnel Operations				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.010	Chapter 18, 18.6 Signals and Train Control - Traction Current Return	AC	04/22/22	Train detection equipment should be, where possible, immunized against traction return current at a LRU level - AC immune relays, filters etc., in addition to the provision of impedance bonds	05/18/22	MJS	A	Added the following sentence: "In addition to provisions for impedance bonds, train detection equipment must protect against incompatible traction return current such alternating current immune relays and filters."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
HSR.011	Section 14.2.2.2, 14-3	EAS	10/01/18	LEGACY Comment HSR18.002 - Should the Static Wire be termed "aerial" and not "optical"?	04/06/22	MJS	C	The optical static wire is multi-purpose, The fiber optic strands can be used for communication purposes while the 4/0 AWG ground wire in the center provides protection against lightning				05/18/22	MJS	Original comment assumed static and aerial optical where two distinct wires - Caltrain uses a multi-purpose optical static wire. Comment considered closed	05/18/22	CC
HSR.012	Section 14.2.2.1, 14-3	XB	10/01/18	LEGACY Comment HSR18.047 - 14.2.2.1 Traction Power Facility Data - At paralleling stations, a single 50/25 kV autotransformer shall be assumed, rated at 10 MVA, with 1.2% impedance - needs to be confirmed	04/06/22	MJS	C	Paralleling station parameters design assumptions have not changed thus far.							05/24/22	CC
HSR.013	Chapter 15, 15-1	MBr	10/01/18	LEGACY Comment HSR18.048 - Chapter 15 Scope - Shall also include bi-directional communications to CHSR OCC to relay all fault codes, health and diagnostic voice, video and text messages.	04/06/22	MJS	A	Revised Chapter 15 "Scope" as follows: "Correspondingly, the design of the DTX voice and train control system must be compatible and consistent with the Caltrain design and include bi-directional communications to California High-Speed Rail Authority operations control center (OCC) to relay all fault codes, health and diagnostic voice, video, and text messages."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC

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Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 18, Rail Systems*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Steve Adkins (Design Team/Parsons)	SRA	E. Mortlock (Design Team/Parsons)	EM
Andrew Clapham (CHSRA)	AC	Philip Gilmour (CHSRA)	PG
X. Banko (CHSRA)	XB	M. Brunner (MBr)	MBr
Rusty Dudley (Caltrain)	RD	Uhila Makoni (Caltrain)	UM
Rick Bartholomew (Caltrain)	RB	Luis Zurinaga (SF CTA)	LZ
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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Cal.001	Chapter 18	UM	04/29/22	Design should include Chapter 28 Communications Design Criteria from PCEP Design Criteria	05/18/22	MJS	A	Revised as noted				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.002	Chapter 18	UM	04/29/22	Remove all references to 'CBOSS' and keep PTC	05/18/22	MJS	A	Revised as noted				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.003	Chapter 18	UM	04/29/22	add Fiber Optic Association (FOA) to Codes and Standards section	05/18/22	MJS	A	Revised as noted				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.004	Chapter 18 Scope	RD	04/29/22	Caltrain doesn't have a CBOSS PTC system. Caltrain has an IETMS PTC system that is in operation.	05/18/22	MJS	A	Revised as noted				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.005	Chapter 18.4 ATCS Fiber Optic System	RD	04/29/22	Office to field communication uses the ATCS protocol for train control and DNP3 for traction power. Both are on the fiber optic network.	05/18/22	MJS	A	Moved to Ch. 19 Communications. (renamed SCADA system)				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.006	Chapter 18.4	UM	04/29/22	Rename ATCS Fiber Optic System section to SCADA System. Replace ATCS references with SCADA. ATCS is a radio protocol used for centralized train control. ATCS/CTC is not be synonymous with Caltrain Fiber Optic Backbone.	05/18/22	MJS	A	Revised as noted				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.007	Chapter 18.7	UM	04/29/22	Add reference to Positive Train Control system and integration of Caltrain's existing PTC.	05/18/22	MJS	A	Revised to add the following sentence: "The DTX PTC must be fully integrated with Caltrain's existing PTC system."				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response necessary, thus the comment is considered closed.	05/18/22	CC
Cal.008	Chapter 17	RB	10/18/18	LEGACY Comment Cal18.040 - Chapter 17, under "Scope" (second paragraph, fifth sentence - amend to read as follows) "Performance and safety of the train control system will be based on the Caltrain signal system."	04/06/22	MJS	A	Revised as noted.				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/18/22	CC
Cal.009	Chapter 17	RB	10/18/18	LEGACY Comment Cal18.041 - Chapter 17, under "Codes and Standards" (fifth bullet, highlighted text - "Parts 234") Part 234 applies to Grade Crossing	04/06/22	MJS	A	Reference to "Part 234" will be removed from the list of codes and standards				05/18/22	MJS	Designer agreed to comply with comment and made necessary change. No back-check response was received from Caltrain, thus the comment is considered closed.	05/18/22	CC
TA.001	Section 18.1.2 Traction Power Load Flow Calculations (first para, last sentence)	LZ	07/04/22	States: "must determine whether PS-1 can provide sufficient traction power to the DTX project". When will that determination take place? what if it does not provide enough juice? Adding a paralleling station or substation is not in the scope or budget for the project. The analysis must be done ASAP,	09/13/22	MJS	C	The PMPC Team has coordinated closely with the TJPA, Design Team, Caltrain, and Caltrain's Traction Power consultant (Gannett Fleming) to develop the SOW for a Load Flow Assessment (LFA). The draft LFA SOW has been approved and TJPA has allocated funding to support the effort. The Design Team is preparing a NTP to be issued before October, 2022. The total timeline of the LFA effort is expected to take roughly 6-months. The 30% construction cost estimate includes an allowance for a paralleling station.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - After reviewing the cost estimate, there is an allowance for a paralleling station in the final PE cost estimate	10/11/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/11/22	CC
TA.002	Section 18.2.1.2, Environmental Conditions	LZ	07/04/22	System should be able to support speeds higher than the maximum authorized speed	09/13/22	MJS	A	Disagree, in terms of OCS design, the speed does not substantially impact design unless approaching speeds in excess of 60mph. The track alignment geometry and constraints within the tunnel would make an increase of more than 10mph unsafe. There are always safety factors applied to the design of an OCS system and there is no need for redundancy. Modified sentence to include "at least" accomodate MAS.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with the PMPC response and revision.	10/11/22	MJS	The responder (PMPC Team) provided clarification/explanation of original comment; therefore this comment is considered closed.	10/11/22	CC
TA.003	Section 18.4, Signals and Train Control (Second para)	LZ	07/04/22	Replace "is implementing" with "has implemented"	09/13/22	MJS	A	revised as noted.				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

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% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 19, Communications*		
Document date:	*4/6/2022*		

Reviewers			
Name	Initials	Name	Initials
Lindsay Yamane (Design Team)	LY	Rusty Dudley (Caltrain)	RD
Uhila Makoni (Caltrain)	UM	Andrew Clapham (CHSRA)	AC
James Deane (CHSRA)	JD	Paul Hebditch (CHSRA/HNTB)	PH
Luis Zurinaga (SF CTA)	LZ		
Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

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GEC.001	Chap 19 - Scope	LY	08/03/22	(Bullet beginning "Caltrain Engineering Standards..") Should the "Caltrain Design Criteria" include "latest edition"?	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.002	Chap 19 - Scope	LY	08/03/22	(Bullet beginning "Peninsula Corridor Electrification Program..) Should the PCEP design Criteria be referred to by "issue date"? It will be revised by Caltrain and likely updated/issued in early 2023.	09/13/22	MJS	A	The intro sentence to the list states that the "latest version" of the listed criteria and guidance should be used. So I think that should take care of it.				10/19/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/19/22	CC
GEC.003	19.4 Closed Circuit Television	LY	08/03/22	(Bullet beginning "Points of access to restricted areas..) There is no section 20.1.2.2 - please add or correct subsection reference	09/13/22	MJS	A	Revised reference to Section 14.5, Ventilation and Emergency Egress Structures				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.004	19.4 Closed Circuit Television	LY	08/03/22	(Add bullets after "Elevator Cabs") *Ticket vending machines and other patron fare collection systems * Blue Light Stations and cross-passageway doors	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.005	19.5 Variable Message Signs	LY	08/03/22	Editorial: Title includes a number one (1) in "1Variable Message Signs"	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.006	19.8 Intrsion Detection/Access Control	LY	08/03/22	(First Para, last sentence) Should "Caltrain PCEP Design Criteria inlcude the "Caltrain Design Criteria (August 1, 2020, or latest edition)" as this will describe ID/AC requirements throughout system.	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
GEC.007	19.9 Supervisory Control and Data Acquistion	LY	08/03/22	(Add bullet after "Blue Light Stations..") * Cross-passage doorways in partitioned tunnel section	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
Cal.001	Chapter 19	UM	04/29/22	Scope should cover existing Caltrain facilities that will serve as primary head end for communication systems and SCADA i.e. Menlo Park Control Center, San Jose Control Center, San Carlos Office	05/17/22	MJS	A	Agreed - reference added to primary head end as noted.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.002	Chapter 19	UM	04/29/22	Fiber Optic Communications Backbone needs a design criteria to integrate Caltrain's existing drawings, standards, and specifications.	05/17/22	MJS	DE	Further coordination and data sharing is needed between Caltrain, PMPC, and design team - once an agreement is established, criteria will be added				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.003	Chapter 19	UM	04/29/22	add Fiber Optic Association (FOA) to Codes and Standards section	05/17/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.004	Chapter 19	UM	04/29/22	Add subsystem PTC, Wi-Fi, data radios i.e. 220 MHz	05/17/22	MJS	DE	Further coordination and data sharing is needed between Caltrain, PMPC, and design team - once an agreement is established, criteria will be added				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.005	Chapter 19.1 Communications Network System	RD	04/29/22	Caltrain doesn't have a CBOSS PTC system. Caltrain has an IETMS PTC system that is in operation. The PTC, signaling and traction power systems are separate systems but all both use the fiber optic network.	05/17/22	MM	A	The criteria was updated based on the PCEP design criteria which referenced the CBOSS system. Will update to reference IETMS.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.006	Chapter 19.1	UM	04/29/22	Rename Communications Network System to Operations Technology (OT) Network.	05/17/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.007	Chapter 19.1	UM	04/29/22	Remove all references to 'CBOSS' and keep PTC	05/17/22	MM	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.008	Chapter 19.1	UM	04/29/22	DTX OT Network design shall eliminate network delays and/or outages as a result of network spanning tree convergence.	05/17/22	MJS	A	Revised as noted				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.009	Chapter 19.9 Supervisory Control and Data Acquisition System	RD	04/29/22	What is meant by the SCADA system? At Caltrain, the SCADA system is the back office system that interfaces with the traction power system. The same back office system also interfaces with the signaling and PTC systems. In addition to the PCEP design criteria, the DTX extension must also meet the requirements of the signaling and PTC design criteria.	05/17/22	MM	C	SCADA in the stations and tunnels will allow for essential fire/life/safety systems to be coordinated with the train control systems. TJPA is working closely with Caltrain on the systems related submittals to ensure Caltrain's needs are met. If a criteria becomes available, it will be included in the next issue of the design criteria. Will carry over to risk register.				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
Cal.010	Chapter 19.10	UM	04/29/22	Add Clipper system to Automated Fare Collection System	05/17/22	MJS	A	Revised to read as follows: "Ticket vending machines for the Fourth and Townsend Street Station and transit center must be furnished, tested, and commissioned by Caltrain, be compatible with the Clipper system, and must conform to the Caltrain's PCEP design criteria. "				8/5/2022	MJS	The Design Team did not object or reopen this comment during offical review of the DTX Design Criteria Rev Book 02 - Draft Final (June 1, 2022) and this comment review log.	8/5/2022	CC
HSR.001	Chapter 19, Communications Scope	AC	04/22/22	No reference to the requirements for communications links between the Salesforce Transit Center and CEMOF/Menlo Park for operational communications in the event of certain failure events, this would be required in the event of fallback operations	5/17/2022	MM	C	Caltrain is still assessing their needs with regards to the emergency mimic train control facility. TJPA is working closely with Caltrain on the systems related submittals to ensure Caltrain's needs are met. If a criteria becomes available, it will be included in the next issue of the design criteria.				05/17/22	MM	The responder (PMPC Team) acknowledged original comment; therefore this comment is considered closed.	05/17/22	CC
HSR.002	Section 16.10, 16-8	PH	10/01/16	LEGACY Comment HSR18.016 - Fare collection issues should also be discussed with CHSR as they will operate at 4th and Townsend	04/06/22	MJS	C	The Fourth and Townsend Street Station technical working group (comprised of IPMT, PMPC, and GEC) is responsible for coordinating the design of the underground station aspects: Programmatic space requirements, emergency egress/Point of safety, vertical conveyance, architectural, structural, and operational.				05/17/22	MJS	Fare collection is primarily a Caltrain issue at Fourth and Townsend Street Station - on-going coordination regarding programmatic space requirements and paid areas will ultimately dictate design requirements which will be captured in the DTX Design Criteria once solidified.	05/17/22	CC
HSR.003	Chapter 16 (General)	JD	10/01/16	LEGACY Comment HSR18.076 - Reference CHSRA design requirements and coordinate relevant standards	04/06/22	MJS	A	CHSRA design criteria manual added to the list of references under "Codes and Standards" for Chapter 16.				05/17/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/17/22	CC
TA.001	Section 19.3, Public Address and Talking Sign	LZ	07/04/22	Has consideration been given to include PAS in the tunnels to inform/direct passengers in the event of an emergency?	09/13/22	MM	C	At this time, WiFi will be used to communicate with the public in the tunnel as well as the train-based PAS system.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA is concerned about passengers exiting trains and heading to an exit that may not be viable - recognize that this is not a standard/requirement and the condition is unlikely.	10/11/22	MJS	The responder (PMPC Team) has agreed to discuss this topic and how to mitigate the potentiality during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/11/22	CC
TA.002	Section 19.5, Variable Message Signs	LZ	07/04/22	Remove "1" from title	09/13/22	MJS	A	Editorial: Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.003	Section 19.10, Automated Fare Collection System	LZ	07/04/22	Fare collection is not part of the communication system	09/13/22	MJS	B	Disagree, Fare collection machines will require fiber optic/ethernet connection to a local area network (LAN) infrastructure for monitoring and control among other communication needs.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with PMPC response.	10/11/22	MJS	The responder (PMPC Team) clarified the orginal commentor's inquirty, no change required - comment is considered closed.	10/11/22	CC

Transbay Program
Downtown Rail Extension (DTX)
Review Comment Sheet

Total Comments 9
Comments Closed 9
% Complete 100%

Document Control File Code:

Project:	*Downtown Rail Extension (DTX)*	**Reviewer Organization:**	Multiple
Phase:	*Preliminary Engineering*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria DRAFT Book Revision 02 - Chapter 20, Corrosion Control*		
Document date:	*4/6/2022*		

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Responders			
Matt Schreffler (PMPC/Mott MacDonald)	MJS	Meghan Murphy (PMPC/AECOM)	MM

AC – Action Code
A – Responder agrees and will comply
B – Responder disagrees for reasons noted
C – Answer provided; no action needed
DE – Designer to evaluate

RS – Response Status
ROK – response okay
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Review Team					PMPC Team				Review Team			PMPC Team			Review Team	
No.	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
HSR.001	Section 19.4, 19-2	EAS	10/01/18	LEGACY Comment HSR18.003 - 1st. Bullet - The DTX electrification is via an AC System not DC as such there are no positive or negative traction power distribution circuits. If the reference is meant to be to the Negative Feeder (a common term for a 2 x 25kV System) with the OCS being the "positive" circuit - both are energized at 25kV to ground and therefore there cannot be any direct connections to ground.	04/06/22	MJS	A	Revised as noted: "Operate and maintain the DTX system with no direct or indirect electrical connections to dc traction power distribution circuits of adjacent transit systems."	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.002	Section 19.4, 19-2	EAS	10/01/18	LEGACY Comment HSR18.004 - Last Paragraph: clarify that ……. DTX structures shall be protected from direct contact with "DC System" anchors and foundations etc.	04/06/22	MJS	A	Revised as noted.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.003	Section 19.4.1, 19-2	EAS	10/01/18	LEGACY Comment HSR18.005 - Strongly recommend that minimum size be specified for rebar used as a part of the grounding system.	04/06/22	MJS	A	This section addresses requirements for reinforcement bonding only where required for stray current mitigation from other transit systems/dc sources. This section does not address reinforcement sizing or grounding and bonding requirements for AC safety.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.004	Section 19.4.1, 19-2	EAS	10/01/18	LEGACY Comment HSR18.006 - Strongly recommend that a minimum size requirement is included for copper conductors used as continuity bonds.	04/06/22	MJS	DE	This section addresses requirements for reinforcement bonding only where required for stray current mitigation from other transit systems/dc sources. Added a minimum bond cable size of AWG #1/0 stranded copper cable.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
HSR.005	Section 19.5.4, 19-4	EAS	10/01/18	LEGACY Comment HSR18.007 - Strongly recommend that a minimum size requirement is included for copper conductors used as continuity bonds.	04/06/22	MJS	A	This section addresses continuity bonding of mechanically joined pipelines for stray current mitigation only. Added a minimum continuity bond cable size of AWG #6 stranded copper cable.	05/16/22	ROK		05/16/22	MM	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	05/16/22	CC
TA.001	Section 20.1.2, Survey (First para)	LZ	07/04/22	Insert "existing corrosion control measures in" between" identify" and "utilities"	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.002	Section 20.5.5, Cathodic Protection (Third para)	LZ	07/04/22	Why just tanks owned by the TJPA vs tanks in the project?	09/14/22	MM	A	Will remove "owned by TJPA".				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC
TA.003	Section 20.5.6, Test Facilities	LZ	07/04/22	Bc specific. Test facilities for what purpose?	09/13/22	MJS	A	Revised as follows: "The requirements for test facilities for soil and water corrosion control must be included as part of the design."	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA agrees with PMPC response.	10/11/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/11/22	CC
TA.004	Section 20.5.7, Casings (First para)	LZ	07/04/22	Add "or manufacturer" after Owner	09/13/22	MJS	A	Revised as noted				10/04/22	MJS	The responder (PMPC Team) agreed to update per original comment; therefore this comment is considered closed.	10/04/22	CC

REV. 02 Chapter #	REV. 01 Chapter #2	Chapter Title	Batch #	# of Pages	Date Received	Primary Responsibility	STATUS	Total Comments	Closed Comments	Remaining	% Complete
Chapter 01	*Chapter 01*	Overview	1	8	12/2/2021	Kaku	Editorial	51	51	0	100%
Chapter 02	*Chapter 02*	Owners Requirements	4	6	5/5/2022	Schreffler	Editorial	86	86	0	100%
Chapter 03	*Chapter 03*	Safety and Security	1	3	12/2/2021	Schreffler	Editorial	7	7	0	100%
Chapter 04	*Chapter 04*	Environmental Requirements	1	5	12/2/2021	Schreffler	Editorial	9	9	0	100%
Chapter 05	*Chapter 05*	Civil Design	1	9	12/2/2021	Spargur	Editorial	32	32	0	100%
Chapter 06	*Chapter 06*	Utilities	2	5	3/25/2022	Spargur	Editorial	6	6	0	100%
Chapter 07	*Chapter 07*	Guideway Geometrics	2	15	3/25/2022	Schreffler	Editorial	123	123	0	100%
Chapter 08	*Chapter 08*	Trackwork	2	5	3/25/2022	Schreffler	Editorial	109	109	0	100%
Chapter 09	*Chapter 09*	Geotechnical Requirements	2	13	3/25/2022	Kaku	Editorial	104	104	0	100%
Chapter 10	*Chapter 13*	Seismic Design	3	13	4/15/2022	Kaku	Editorial	70	70	0	100%
Chapter 11	*Chapter 10*	Protection of Existing Inf	2	8	3/25/2022	Kaku	Editorial	50	50	0	100%
Chapter 12	*Chapter 11*	Structures	2	22	3/25/2022	Kaku	SME Response	123	123	0	100%
Chapter 13	*Chapter 12*	Tunnels	3	19	4/15/2022	Schreffler	Editorial	99	99	0	100%
Chapter 14	*Chapter 20 & 21*	Architecture	3	27	4/15/2022	Kaku	Editorial	131	131	0	100%
Chapter 15	*Chapter 22*	Fire-Life Safety	3	10	4/15/2022	Kaku	Editorial	41	41	0	100%
Chapter 16	*Chapter 23*	Mechanical Systems	4	35	5/5/2022	Kaku	Editorial	50	50	0	100%
Chapter 17	*Chapter 24*	Electrical Systems	4	21	5/5/2022	Schreffler	Editorial	14	14	0	100%
Chapter 18	*Chapter 14, 15, 17*	Rail Systems	4	8	5/5/2022	Schreffler		47	47	0	100%
Chapter 19	*Chapter 16*	Communications	4	5	5/5/2022	Schreffler	Editorial	23	23	0	100%
Chapter 20	*Chapter 19*	Corrosion Control	4	9	5/5/2022	Kaku	Editorial	9	9	0	100%
				246				**1184**	**1184**	**0**	**100%**

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Transbay Program
Phase 2
Review Comment Sheet

Total Comments	**24**
Comments Closed	**24**
% Complete	**100%**

Document Control File Code:

Project:	*Transbay Program*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Downtown Rail Extension (DTX)*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria Revision Book 02 - ACTION ITEMS TO CARRY FORWARD*		
Document date:	*10/21/2022*		

Reviewers			
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Pete Gutierrez (Caltrain)	PCG	Heather Kim (Design Team/PCPA)	HK
Douglas McLoud (CHSRA)	DMcL	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Nader Shahcheraghi (PMPC SME/ AECOM)	NS		

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Review Team						PMPC Team				Review Team			PMPC Team			Review Team	
Rev Book 02 Chapter	**No.**	**Reference**	**By (initials)**	**Date (mm/dd/yy)**	**Reviewer Comment**	**Date (mm/dd/yy)**	**Responsible Responder**	**AC**	**PMPC Response**	**Date (mm/dd/yy)**	**RS**	**Back-Check Comment (if applicable)**	**Date (mm/dd/yy)**	**Responsible Party**	**PMPC Additional Response/ Next Steps**	**Date (mm/dd/yy)**	**Final BRS**
04, Environmental Requirements	Cal.001	Chapter 4 Section 4.2; (Page 4-2 of 4)	PCG	06/17/22	Environmental Requirements: Be beneficial to have projected ambient temperatures within the tunnel and covered section of the track system - Helpful in determining the desired rail neutral temperature	09/01/22	MJS	C	The ambient temperature and humidity ranges for the tunnel will be determined through analysis/design work and will depend primarily upon the air flow modeling and ambient air exchange and mechanical damper system. It is not our intent to include this as a design criteria.				10/06/22	MJS	The responder (PMPC Team) has agreed to provide ambient/design temperature and humidity ranges within the tunnel and underground structures during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/06/22	CC
07, Guideway Geometrics	Cal.034	Chapter 7, Section 7.3.5.1; (Page 7-14 of 15)	BZ	06/30/22	Table 7-8 - Change tolerances to +- 0.125 for Ballasted and Direct Fixation track. Refer to Caltrain Specs 20400 for track constuction tolerance.	09/01/22	MJS	C	Caltrain track construction tolerance requirement for ballasted track is 0.5" (vertical and horizontal). The DTX Design Criteria may need to be updated once Caltrain publishes updated Caltrain Standard Specifications (end of 2020)				09/27/22	MJS	The responder (PMPC Team) held a CRM with Caltrain on 9/27/2022 where resolution was achieved and the DTX Design Criteria was updated.	09/27/22	CC
07, Guideway Geometrics	HSR.005	subheading 7.2.7.2	DMcL	03/16/22	Where have the all the values for superelevation in Table 7-3 been taken from as there is no mention of these in the Caltrain Design Criteria, Chapter 2 - Track AFFECTS: Caltrain	05/10/22	MJS	DE	DTX Design Criteria REV 01, released in 2009 and reviewed by the Operators in 2016/2018 included Table 7-3 - Maximum Superelevation. Absolute maximum values for actual (5 in) and unbalanced superelevation (3 in) are stated in the Caltrain Design Criteria, Chapter 2 - Track, Part C - Track, subsections 4.0-4.2. Desirable values for actual (currently 4 in) and unbalanced superelevation (currently 3 in) were updated based on Caltrain comments. The "Maximum negative unbalance for slowest operating speed on curve" line has been removed and a sentence added after the table noting that negative unbalance will be avoided.	06/27/22	BCC	In October 2018 a Basis of Design Memo was approved by Caltrain and CAHSR which amended the Caltrain Design Criteria in Sections 1, 4 1nd 5.2. These amendments should be used between San Francisco to South of CP Lick. I would have thought these should also form part of the DTX Project as it is on the Caltrain ROW. If these were not issued it will need confirmation that these have not to be used and highlighted accordingly (I do note that the maximum superelevation in the 2020 version of the Caltrain Design Criteria is quoted as 5 inches)	10/07/22	MJS	The responder (PMPC Team) has reviewed the backcheck comment provided by CHSRA and reviewed the 2018 Basis of Design Memo. Given the proposed MAS for the project limits and lack of agreement between TJPA regarding applicability to the DTX project, this comment will remain unchanged for this version of the DTX Design Criteria (living project document). The PMPC Team agrees to carry forward this concept/conflict for further discussion and resolution in the next phase of design.	10/07/22	CC
07, Guideway Geometrics	HSR.027	Chapter 7 General	DMcL	03/16/22	There is no mention of a continuous check rail (restraining rails) for the tight radius curve of 650 feet radius. From a study I have read it would seem that in the US they are using 500 feet and below, however there are times when greater than 500 feet they have been used. As we do not know what trainset CAHSR will be adopting I feel that an allowance should be made for the use of these. AFFECTS: CHSRA	05/18/22	MM	C	Guard rail criteria can be found in Chapter 8. The current design includes guard rails on the 650 ft radius curves.	06/27/22	BCC	In this comment I am discussing continuous check rails (restraining rails) which are in place to stop derailments on tight radius curve. As the 650 feet radius is on the approach to station platforms it may be worthwhile consdering having these in place	09/01/22	MJS	The responder (PMPC Team) agrees to investigate including tight curve restraining rail requirements in the next version of the DTX Design Criteria (living project document). Restraining rails have been added to the PE design on tight radius curves.	10/07/22	CC
07, Guideway Geometrics	HSR.032	CAHSR/PG/003	PGi	07/03/22	Table 7-10 - the listed minimum horizontal clearance for CAHSR is 9ft3in this is incorrect. Please advise where this figure was derived.	05/10/22	MJS	A	Revised to 8 ft 7 in.	06/22/22	BCC	The DCM has been revised to show a horizontal offset from track CL to tunnel wall as 8ft 7in, this is still incorrect. The minimum horizontal clearance for CHSR is 10ft 8in. This figure has been listed incorrectly on 2 occasions and I would ask where these figures are being derived.	10/12/22	MJS	The values provided in the DTX criteria for minimum horizontal clearances are derived from CPUC GO 26-D, Section 9, which states the following: "9.2 Minimum side clearances of railroad and street railroad tracks which are not used or proposed to be used for transporting freight cars shall be thirty (30) inches from the side of the widest equipment operated, except that for poles support trolley contact conductors between main line double tracks such distance may be decreased to twenty-four (24) inches." The last DTX Design Criteria (May 2009) listed this value for CHSRA as 8'-3". CAHSR FJ Blended criteria stated 9'-3". The CHSRA vehicle dynamic envelope (VDE) is the controlling clearance envelope of the DTX project. The maximum horizontal data point provided by CHSRA was 6.055 feet (assume 6'-1"). Adding 30" from CPUC results in 8'-7". Requiring 10'-0" clearance (an additional 25") of horizontal clearance on each side of all tracks would impact project cost by orders of magnitude. The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
07, Guideway Geometrics	HSR.033	CAHSR/PG/004	PGi	07/03/22	Table 7-10 - Lines 1 and 2 of this table state the same information, please advise if these should differ.	05/10/22	MJS	C	First line is below-grade, second line is at-grade	06/22/22	BCC	Agree with comment responses however listed horizontal clearance for CHSR is incorrect. States 9ft 3in this should read 10ft 8in.	10/12/22	MJS	The PMPC Team has reviewed CHSRA Design Criteria (Rev 5) Chapter 23 - Trackway Clearances. Section 23.2.1.2.1 Minimum Horizontal Clearances from High-Speed Rail Track Centerline. The 10'-8" dimension is to centerline of OCS poles (not face) so this dimension is not needed. The argument will be on the "Face of fixed equipment" being 10 feet (0 inches) clearance. Further coordination and agreement(s) between TJPA, CHSRA, and Caltrain are needed to resolve minimum horizontal clearance. Requiring 10' horizontal clearance to elements within the DTX tunnel would result in excessive and unnecessary cost given the low MAS (30mph max. within tunnel). The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
07, Guideway Geometrics	HSR.034	CAHSR/PG/005	PGi	07/03/22	Table 7-11 - clearance to tunnel crown is listed as 24ft6in desirable, 21ft6in absolute. These values do not align with the working values for CAHSR, please advise where these values were derived. CAHSR mandated values are 27ft desirable, 24ft6in absolute.	05/13/22	MM	C	Please see approved DVR 0011 allowable clearance = 21'-6".	06/22/22	BCC	Disagree with the response. CHSR DVR0011 deals with the along track positioning of OCS structures and not tunnel heights. Please can the consultant forward the supporting document they refer to. Additionally, approval of any previous DVR does not mean that those criteria can be applied wholesale across the infrastructure. The CHSR values are as stated in my original comment and must be complied with.	10/12/22	MJS	Refer to Transbay Transit Center FRA Sign-off documents prepared by PCPA and approved by TJPA and CHSRA in 2013. This document (separate from the previously referenced DVR0011) justifies the minimum vertical clearance of 21'-6". The responder (PMPC Team) recognizes the point made in the backcheck response from the commentor about the applicability of an approved design variance request (DVR 0011) - The FRA sign-off document, approved by CHSRA does set a precendence for low-speed tunnel conditions. The responder (PMPC Team) recognizes this topic has been discussed and challenged in the past that demands official sign-off from the Operators before the procurement stage of design.	10/12/22	CC
08, Trackwork	HSR.002	8.1.1	DMcL	03/22/22	The track gauge will be 4 feet 8.5 inches, not just on tangent track except on tight radius curves where gauge widening may be required.	05/12/22	MJS	A	Revised to read as follows: "Track gauge will be 4 feet 8.5 inches, measured at 0.625 inches below the head of the rail on the gauge side on all tracks except on tight radius curves where gauge widening may be required."	06/27/22	ROK	Accepted with amendments. At what radius will gauge widening be required. Does the project have radii that fit the criteria, if so gage widening criteria needs to be shown	10/7/2022	MJS	The responder (PMPC Team) agrees to coordinate with operators and define threshhold for gauge widening and requirements will be addessed at the next stage of design. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/7/2022	CC

Transbay Program
Phase 2
Review Comment Sheet

Total Comments 24
Comments Closed 24
% Complete 100%

Document Control File Code:

Project:	*Transbay Program*	**Reviewer Organization:**	Design Team (Parsons)
Phase:	*Downtown Rail Extension (DTX)*	**Responder Organization:**	PMPC Team
Document name:	*DTX Design Criteria Revision Book 02 - ACTION ITEMS TO CARRY FORWARD*		
Document date:	*10/21/2022*		

Reviewers			
Name	Initials	Name	Initials
John Bumanis (Design Team/Parsons)	JB	Phillip Gilmour (CHSRA)	PGi
Pete Gutierrez (Caltrain)	PCG	Heather Kim (Design Team/PCPA)	HK
Douglas McLoud (CHSRA)	DMcL	Bin Zhang (Caltrain)	BZ
Luis Zurinaga (SF CTA)	LZ		
Responders			
Meghan Murphy (PMPC/AECOM)	MM	Matt Schreffler (PMPC/Mott MacDonald)	MJS
Nader Shahcheraghi (PMPC SME/ AECOM)	NS		

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11, Protection of Existing Infrastructure	HSR.001	Chapter 11 - Scope	FW	03/28/22	"This chapter seems to focus on existing structure protection during construction ""resulting from excavation associated with the construction"". Should the scope also address the post-construction seismic resistance/response (i.e.: no added harm due to the new construction) of the existing structures ? Section 10.2 discusses additional loads imposed upon existing foundations with respect to excavation related ground movements, and mitigations (underpinning, protective works), but not post-construction existing structure seismic response. Is the assumption that the post-construction existing structure seismic resistance/response the same as the current pre-construction state ?"	05/25/22	MJS/DP	B	No, the suggested scope to address post-construction seismic resistance/response of existing structures is not considered within the scope of the DTX Design Criteria.	06/23/22	BCC	Understood, not within scope of DTX Design Criteria. However, to avoid future disputes, recommend TJPA consider existing structure be subject to "no added harm due to new construction" per the original comment.	10/06/22	MJW	The commentor (CHSRA) agreed that the topic is not within the scope of the DTX Design Criteria. The responder (PMPC Team) has agreed to investigate the proposed clause during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/06/22	CC
12, Structures	TA.002	Section 12.1.8, Waterproofing	LZ	07/04/22	Waterproofing design has to address potential leakage resulting from improper membrane installation	09/02/22	NLV	B	Improper constuction and installation repairs will be addressed in Specifications and Technical Requirements.	10/05/22	LZ	Based on experience, waterproofing is never perfect regardless of effort.	10/05/22	MJS	The responder (PMPC Team) has agreed to develop requirements for waterproofing system and failure repair procedures. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
12, Structures	TA.004	Section 12.1.8, Waterproofing (Second para)	LZ	07/04/22	States: "Where reinforced concrete is to be placed against the waterproofing membrane, no damage to the exposed membrane surface that would permit seepage through the membrane is allowed". This is the achilles heel of membrane waterproofing. Damage that is not easily detected and can esily occur, specially during rebar installation. If membrane waterproofing is to be used, there needs to be a requirement that very strict QA/QC procedures must be developed and monitored.	09/02/22	NLV	B	Improper constuction and installation repairs will be addressed in Specifications and Technical Requirements.	10/05/22	LZ	During CRM with SF CTA on 10/5, it was agreed that stringent quality requirements for the waterproofing system will be covered under technical specifications during the next phase of design.	10/05/22	MJS	The responder (PMPC Team) has agreed to develop requirements for waterproofing system and failure repair procedures. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
12, Structures	TA.012	Section 12.2.2.5, Joints (B. Construction Joints) (fifth sentence)	LZ	07/04/22	There are many types of waterstops, some more effective than others. Which types are recommended?	09/02/22	NLV	B	Waterstop requirements or definition are better suited to a Technical Requirements or Specifications document. Suggest to leave off Design Criteria, but include in Technical Requirements or Specifications.	10/05/22	LZ	During CRM with SF CTA on 10/5 - It was agreed that the waterstop type will be defined during the next phase of design in a technical specification/requirement.	10/05/22	MJS	The responder (PMPC Team) has agreed to define waterstop type and to develop requirements and specifications for waterstops. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/05/22	CC
13, Tunnels	Cal.015	Chapter 13 Section 13.5.4; (Page 13-14 of 20)	JP	06/30/22	Load sharing between the temporary construction support and the final lining of the mined tunnel shall be justified by analysis and approved by TJPA prior to NTP for final design. (reference MINED Tunnel Design Preliminary Engineering Technical Memorandum 334.1.1)	08/19/22	DP	C	Please refer to comment GEC.010 above, and the resolution with the GEC. There is no way the integrity of the initial support can be verified after the maximum seismic event.				10/04/22	MJS	See response to comment GEC.010 above. We met with the GEC to discuss load sharing, with the intent of determining how we can verify the integrity of the initial support after a maximum seismic event, which it is not designed to withstand, and trying to understand the cost implications of the criteria. Per that comment we may revisit this issue later. As stated, this could also be proposed as a VE savings though that too would need to address post-seismic event support integrity. The responder (PMPC Team) has agreed to investigate load sharing concepts during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
13, Tunnels	HSR.007	Section 13.2.3. p. 5	SK	03/28/22	Shouldn't design ground loads be given in the Geotechnical Baseline Report (GBR). There should be an interpretive geotechnical report that defines the ground loads and groundwater pressures for design.	05/03/22	DP	C	Ground loads will not be provided in the GBR. For a DB or other alternative procurement, these will be developed by the Geotechnical Engineer of Record. Parameters used as part of the Preliminary Engineering can be provided as a reference document.	06/21/22	BCC	Do not agree that it should be up to Geotechnical Engineer of Record to determine design ground loads. The Owner has a vested interest in making sure that lining is designed properly. GBR should indicate minimum design ground loads that must be complied with.	08/19/22	DP	There are many examples of GBR's without minimum design ground loads - LA Metro Measure R Projects, Sound Transit East Link, Northgate Link, U-Link, BART Silicon Valley Extension just to name a few. With the exceptioon of BSVII, these projects have been constructed, with proper lining design. There is significant opportunity for design parameters developed by the Geotechnical EOR to be reviewed for their appropriatenessss. The responder (PMPC Team) will investigate the merits of including minimum design ground loads as a requirement for the GBR during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
13, Tunnels	HSR.018	13.5.4, p. 13	SK	03/30/22	Neglecting load sharing for a SEM tunnel is very conservative. Typically for a tunnel this size, the thickness of the initial support shotcrete will be significant and some of it should be effective for long-term ground support. This requirement should be re-evaluated.	05/03/22	DP	C	The previous version of the DTX Criteria did allow load sharing between the initial support and final lining. Ultimately omitting the load share component is not that conservative. The initial support is penetrated regularly by spiles and other temporary steelwork. It is not designed for the ODE or MDE events. Ensuring it's durability for the 100 year project design life or its integrity after an ODE/MDE event is questionable. The quality of initial lining shotcrete installation would also need to improve significantly prior to accepting this condition - which would necessitate more rigorous quality assurance and control during construction, at a cost premium. Load sharing was not permitted for Chinatown Station, nor for the Regional Connector Cavern, nor for the Sound Transit Bellevue Tunnel. Caltrans Devils Slide tunnels assume deterioration of the initial support and that all loads be supported by the final lining. At this scale the arch final lining is typically thicker than would be required for strength design alone, to accommodate placement of concrete. The cost implications from ignoring a contribution of the initial support are not that great.	06/21/22	BCC	It seems like load sharing with the intial support system could be utilized to safely achieve some cost savings. It is noted that the final lining is 18 to 21 inches thick and reinforced with steel rebar mats on each face. This lining thickness is more than enough for constructability. The initial shotcrete layers may be subject to long-term degradation but subsequent layers would be protected and would not be penetrated by spiling or other rock reinforcement. This is something that may be of interest from a value engineering standpoint.	08/19/22	DP	See response to comment GEC.010 above. We met with the GEC to discuss load sharing, with the intent of determining how we can verify the integrity of the initial support after a maximum seismic event, which it is not designed to withstand, and trying to understand the cost implications of the criteria. Per that comment we may revisit this issue later. As stated, this could also be proposed as a VE savings though that too would need to address post-seismic event support integrity. The responder (PMPC Team) has agreed to investigate load sharing concepts during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
14, Architecture	GEC.041	Section 14.1.3.3, Platforms (Passenger Benches)	HK	08/03/22	The criteria notes that "Passenger benches" at the platform level must be included. However, there is no mention of benches at the Lower Concourse where it will provide waiting/seating areas for rail passengers at Salesforce Transit Center. Also, benches at the platform level should be confirmed with the operator since CHSRA was previously planning to keep passengers on the lower concourse before calling passengers to board and head down to the platform level. In addition, the platform widths and obstructions limit clearances at platform level, therefore, placement of benches will be restrictive.	09/22/22	OA	DE	Comment requires clarification - TJPA will need to define % of projected ridership (Currently unavailable or inaccurate - same for lower concourse)				10/07/22	MJS	The responder (PMPC Team) added a new bullet "passenger benches" to section 14.1.3.3 concourse and lower concourse comment; therefore this comment is considered closed. The responder (PMPC Team) recognizes that the quantity and location of benches will need to be defined once updated ridership numbers are provided by the operators during the next phase of design.	10/10/22	CC

Transbay Program
Phase 2
Review Comment Sheet

Total Comments	**24**
Comments Closed	**24**
% Complete	**100%**

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15, Fire-Life Safety	GEC.001	15.1 - Design Fire Size	JB	04/08/22	Consider keeping the table that is currently provided in the 2009 edition of the criteria. This Table presents information (e.g. MW for trash) that isn't in the RVA criteria. The train fire heat release rate and growth rate are also consistent with the current SES/CFD work being performed.	05/17/22	NS	A	Added the table back into section 15.1.	08/05/22	BCC	The train fire heat release rate and growth rate (and current SES/CFD modeling work) requires further discussion	10/06/22	MJS	Noted. Design Criteria can be updated after further discussion considering SES and CFD analysis modeling. CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
15, Fire-Life Safety	GEC.012	15.1	JB	06/23/22	This section requires that the design train fire size and growth rate conform to the fire sizes indicated in the Transbay Program's Final Risk and Vulnerability Assessment. This may not be feasible with the current system. In addition, the fire heat release rates mandated by RVA criteria are higher than what is being used for the current SES/CFD task.	09/20/22	NS	B	See response to item GEC.001 Fire size and growth rate should be based on the design rolling stock and can not be determined arbitrarily based on what is feasible for the current system. The system should be designed to meet the design criteria, not the other way around.	10/06/22	ROK	CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed treat this comment in same fashion as GEC.001.	10/06/22	MJS	Noted. Design Criteria can be updated after further discussion considering SES and CFD analysis modeling. CRM held with John B., Nader S., and Matt S. on 10/6/22 - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
15, Fire-Life Safety	TA.003	Section 15.2.1, Ventilation System Monitoring and Control	LZ	07/04/22	This section implies that there will be work at the Caltrain CCF by/for the DTX. Is this in the DTX scope/budget?	09/20/22	MJS	C	The interfacing capabilities of Caltrain are not currently captured explicitly in the scope/budget of the DTX project but are accounted for in contingencies. The precise interface requirements and scope will need to be determined and agreed upon between TJPA and the operators during the next phase of design.				10/07/22	MJS	The responder (PMPC Team) provided clarification/explanation on original comment and will agree to carry this concept onto the next phase of design for interface management; therefore this comment is considered closed.	10/07/22	CC
16, Mechanical Systems	GEC.001	16.1.1	JB	04/21/22	1) Section 16.1.5.2 discusses by-pass dampers but does so in the context of temperature control and only if necessary (i.e. "Where necessary during normal operations, bypass shafts must allow air exchange between the outside ambient and the tunnel."). Since both stations will be mechanically ventilated during normal operations, additional by-pass dampers and shafts do not appear to be required to ensure air exchange between the outdoors and the stations. Please verify. 2) Also, there is no requirement in this paragraph or criteria chapter regarding the need for any blast or piston action relief shafts. Please verify that piston action relief is not necessary.	05/17/22	NS	DE	In addition to temperature control, relief shafts may be required to control pressure transients due to portal entry/exit or sudden expansion/contraction of tunnel cross sectional area. Alos, piston effect could cause excessive velocity in stations if piston effect is relieved only through the stations. So the designer should evaluate, using engineering analysis, the need for relief shafts based on these requirements, in addition to temperature control.	08/05/22	BCC	Doesn't address issue associated with requirement for air exchange through by-pass dampers.	10/06/22	MJS	What requirements for air exchange through by-pass dampers, other than those for temperature control and pressure transient control? Please elaborate. **CRM held with John B., Nader S., and Matt S. on 10/6/22** - Currently there is no bypass provisions at the DTX stations. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
16, Mechanical Systems	GEC.004	16.1.4.3	JB	04/21/22	This section requires that the design train fire size and growth rate conform to the fire sizes indicated in the Transbay Program's Final Risk and Vulnerability Assessment. This may not be feasible with the current system. In addition, the fire heat release rates mandated by RVA criteria are higher than what is being used for the current SES/CFD task.	05/16/22	AK	A	The Final Risk and Vulnerability Assessment is being rebranded as the Threat and Vulnerability Assessment (TVA) and is currently in the process of being updated. The design train fire size and growth rate will be verified after the assessment is complete.	08/05/22	BCC	This topic requires further discussion	10/06/22	MJS	**CRM held with John B., Nader S., and Matt S. on 10/6/22** - Agreed to close comment for current version of DTX Design Criteria and carry forward the topic and ensure consistency across all project documents (DTX DCM, TVA, designs, and models) as an action item during the next phase of design.	10/06/22	CC
16, Mechanical Systems	GEC.015	16.1.6.2	JB	06/23/22	1) Section 16.1.6.2 discusses by-pass dampers but does so in the context of temperature control and only if necessary (i.e. "Where necessary during normal operations, bypass shafts must allow air exchange between the outside ambient and the tunnel."). Since both stations will be mechanically ventilated during normal operations, additional by pass dampers and shafts do not appear to be required to ensure air exchange between the outdoors and the stations. Please verify. 2) Also, there is no requirement in this paragraph or criteria chapter regarding the need for any blast or piston action relief shafts. Please verify that piston action relief is not necessary.	09/20/22	NS	C	Piston action relief is necessary. Please see PMPC response dated 05/17/22 to item GEC.001				10/06/22	MJS	What requirements for air exchange through by-pass dampers, other than those for temperature control and pressure transient control? Please elaborate. **CRM held with John B., Nader S., and Matt S. on 10/6/22** - Currently there is no bypass provisions at the DTX stations. Agreed to close comment for current version of DTX Design Criteria and carry forward the topic as an action item during the next phase of design.	10/06/22	CC
17, Electrical Systems	TA.001	Section 17.2.2.1, Emergency Generators	LZ	07/04/22	States: "Generators must be located at street level where possible" Generator in the train box extension is below ground. Even though above ground is possible, it is undesirable. Need to add section for below ground generators	09/14/22	RW	DE	Subsurface generator requirements will be provided during next phase of design				10/04/22	MJS	The responder (PMPC Team) has agreed to incorporate subsurface generator requirements during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/04/22	CC
19, Communications	TA.001	Section 19.3, Public Address and Talking Sign	LZ	07/04/22	Has consideration been given to include PAS in the tunnels to inform/direct passengers in the event of an emergency?	09/13/22	MM	C	At this time, WiFi will be used to communicate with the public in the tunnel as well as the train-based PAS system.	10/11/22	LZ	CRM 10/11/22 with Luis Zurinaga - SFCTA is concerned about passengers exiting trains and heading to an exit that may not be viable - recognize that this is not a standard/requirement and the condition is unlikely.	10/11/22	MJS	The responder (PMPC Team) has agreed to discuss this topic and how to mitigate the potentiality during the next phase of design. The comment will be considered closed for this revision of the DTX Design Criteria and will become an action item to carry forward.	10/11/22	CC