central T subway

Connecting people. Connecting communities.

Transmittal

CS CN 1254 Transmittal No. 0001

To:	Aileen Read	**From:**	Wayne Gilles
	CSDG	**Project No./Contract No.:**	M544.1, CN 1254
	Central Subway Project Office	**Contract Title**	Chinatown Station
	821 Howard St., 2nd Floor	**Phase:**	Construction
	San Francisco, CA 94103	**Subject:**	CTS Construction Specification Conformance Checklist
Date:	November 19, 2012	**Reference:**	

Sent via:	☐ *mail*	☐ *overnight*	☐ *messenger*	☒ *hand-delivered*
	☐ *fax – No:*		☐ *email – Address:*	

The following:			***For your:***
☐ *copy of letter/memo*	☐ *estimate*		☒ *information/use*
☐ *minutes/agenda*	☐ *schedule*		☐ *action*
☐ *cd / dvd*	☐ *NCR*		☐ *review/comment*
☐ *task order*	☐ *RFI/RFC*		☐ *response*
☐ *contract modification*	☐ *RFI/RFC response*		☐ *incorporation of comments*
☐ *specifications*	☐ *submittal*		☐ *signature*
☐ *half-size drawings*	☐ *submittal rejection*		☐ *acceptance/approval*
☐ *full-size drawings*	☐ *submittal disapproval*		☐ *resubmission*
☐ *sketches/maps/layouts*	☐ *submittal approval as noted*		☐ *corrective action*
☐ *reference material*	☐ *submittal approval*		☐ *other*
☒ *other* report			

Item No.	*Copies*	*Description*	*Rev. No.*	*Date*
1	1	Executed CTS Construction Specification Conformance Checklist	0	9/28/12

If enclosures are not as noted, kindly notify us at once.

Remarks: Enclosed please find a copy of executed CN 1254 Chinatown Station Construction Specification Conformance Checklist, Revision 0.

Wayne Gilles
CSP Safety and Security Certification Manager

WG:smk

cc: Melvyn Henry, SFMTA (w/attachments) – via email
Kartik Shah, SFMTA (w/attachments) – via email
John Funghi, SFMTA (w/attachments) – via email
Albert Hoe, SFMTA (w/attachments) – via email
Ross Edwards, CSP (w/attachments) – via email
Mark Benson, CSP (w/attachments) – via email
Eric Stassevitch, CSP (w/attachments) – via email
Quon Chin, CSP (w/attachments) – via email
CS File No. M544.1.3.1254.0590

central T subway

Connecting people. Connecting communities.

Report

Contract CS-149

CONSTRUCTION PHASE

CN 1254
Construction Specification Conformance Checklist

Revision 0

September 28, 2012

Prepared for:

SFMTA

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
821 Howard Street
San Francisco, CA 94103

Prepared by:

CH2MHILL
1000 Wilshire, 21st Floor
Los Angeles, CA 90017

In association with:

C S P Central Subway Partnership
creativity stewardship performance

central T subway

Report

Contract CS-149

CONSTRUCTION PHASE

CN 1254
Construction Specification Conformance Checklist

Revision 0

September 28, 2012

Prepared by: _____ Date: 9/28/12
Wayne Gilles
Manager, CSP Safety and Security Certification

Reviewed by: Kartik Shah Date: 10/3/12
Kartik Shah
SFMTA Transportation Safety Specialist, System Safety

Accepted by: _____ Date: 10/5/2012
Ross Edwards
CSP Program Manager, Project Development and Delivery

Accepted by: _____ Date: 11/14/2012
Albert Hoe
SFMTA CSP Deputy Program Manager

Accepted by: _____ Date: 11-14-12
John Funghi, P.E.
SFMTA CSP Program Director

Approved by: _____ Date: 11-15-12
Melvyn Henry
SFMTA Chief Safety Officer

central T subway

Report

Contract CS-149

CONSTRUCTION PHASE

CN 1254
Construction Specification Conformance Checklist

Revision 0

September 28, 2012

Accepted by: _____ Date: 11/13/12

Mark Benson, P.E.
CSP Construction Manager

1.0 CONSTRUCTION SPECIFICATION CONFORMANCE

The purpose of the Construction Specification Conformance Checklists is to establish a formal process to verify that the as-built facilities, systems, and equipment incorporate the safety and security-related requirements in the Technical Specifications, including approved changes since the final design. Each safety and security requirement contained in the Checklists requires evidence that demonstrates its achievement.

1.1. CONSTRUCTION CONTRACT PACKAGES

The SFMTA is constructing the CSP via five major separate construction contract packages:

- CN 1252 – Tunneling
- CN 1253 – Union Square/Market Street Station
- CN 1254 – Chinatown Station
- CN 1255 – Moscone Station
- CN 1256 – Trackwork, Systems, and Surface Station

Each construction contract has a corresponding Construction Specification Conformance Checklist.

1.2 SAFETY/SECURITY CERTIFICATION STEPS

In general terms, the safety and security certification process for construction specification conformance consists of three steps:

1. Create a list of safety and security technical specification requirements
2. Verify compliance with the requirements
3. Document the review and approval process.

Step 1 – Create a list of safety and security requirements. The first step of the process is to identify the safety and security requirements in CN 1254. The CN 1254 Construction Specification Conformance Checklist is located in Section 2.0. The Safety and Security Certification Review Committee (SSCRC) will review and approve the baseline CN 1254 checklist after any comments are resolved. Requirements may be added to the document as the project progresses, design changes, and/or further identification of safety and security items. Changes to the baseline CN 1254 will be brought to the SSCRC for review and approval.

Step 2 –Verify compliance with the requirements. This step consists of using the conformance checklist to conduct the appropriate reviews to verify that the safety and security related requirements are incorporated into the end products. Methods to accomplish this include: document reviews, contract deliverables, audits, inspections, photographs, and testing. As requirements are verified, the appropriate requirements are completed, stating the method of verification, the date, and the name of the individual performing the verification. The responsible party verifies and signs off on each line item in the checklist. When complete, the responsible party submits the verified checklist to the SSCRC for review and acceptance.

Additionally, the conformance process is audited and reviewed by the SFMTA Safety Division and the CSP Safety and Security Certification Manager. The audit/review process consists of selecting a sample of items from the checklists to review compliance documentation and to evaluate the effectiveness of the conformance process.

Step 3 – Document the Review and Approval Process. Documentation is essential to provide evidence of the various reviews, analyses, tests, inspections, training, and hazard resolution activities performed to ensure the safety and security of the system. Once all the items on the conformance checklists are executed, validated and reviewed, the responsible party completes and signs the associated Certificate of Conformance, and submits it to the SSCRC for review and acceptance. If the SSCRC approves the document, the construction conformance checklist and associated Certificate of Conformance is routed for final signature and approval. It is then transmitted to Document Control for scanning and placement into document control.

2.0 CN 1254 CONSTRUCTION SPECIFICATION CONFORMANCE CHECKLIST

This section contains the CN 1254 Construction Specification Conformance Checklist and describes terms and explanation of items in the checklist format:

1. **Item No.:** Refers to sequential number of safety and security requirement
2. **Spec Section Title:** Refers to specification section title that safety and security requirement is located.
3. **Safety Requirement:** Refers to specific safety and security requirement.
4. **Specification Reference, Sec and Para:** Refers to specification section number and paragraph that safety and security requirement is located.
5. **Status:** Refers to the status of the verification process.
   A – Approved
   DA – Disapproved
   NA – Not Applicable
   UI – Under Investigation
   O – Other
6. **Method of Verification:** Refers to method used by the responsible engineer to verify that the as-built facilities, systems, and equipment incorporate the safety and security-related requirement. Typically methods used include:
   - Document reviews
   - Contract deliverables
   - Audits
   - Inspections
   - Photographs
   - Test results.
7. **Title of Verification Document:** Refers to title, revision, and date of document used to verify requirement.
8. **Approval Document File No.:** Refers to date and specific approval document reference for the verification method.
9. **File Verified, By and Date:** Refers to printed name of individual who verifies that the documents referenced in columns 6, 7, and 8 are accurate and correct for verifying the safety and security requirement in column 3, and date that the files are verified.
10. **Verification Signature:** Refers to the signature of the individual who verifies the documents in column 9.

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
1.	Hazardous Materials Procedure	[The Contractor will submit] The Hazardous Materials Management Plan (HMMP) in accordance with this Section and Section 02 13 00- Hazardous Materials Abatement and Controls.	013500	1.08.A.3							
2.	Training Programs and Operations Maintenance Manuals	[The Contractor shall] submit a Training Program Plan within 300 calendar days of Notice to Proceed.	017900	1.04.A.1							
3.	Facility Testing, Start-Up, and Commissioning	Submit a Testing and Start up Program Plan for City review within 270 calendar days of Notice to Proceed.	018000	1.05.B							
4.	Facility Testing, Start-Up, and Commissioning	Submit a Commissioning Plan and Procedure for City review no less than 60 calendar days prior to the start of the Commissioning Test. The Contractor shall revise and resubmit the Commissioning Plan and Procedure within 20 days after receiving City comments.	018000	1.05.F							
5.	Facility Testing, Start-Up, and Commissioning	A Commissioning Test Report shall be submitted for acceptance within 15 days after completion of the Commissioning test. The Test Report must contain all the data obtained during Commissioning, and analysis of the data and conclusions relating to the test pass/fail criteria outlined in the test procedure. Acceptance and formal approval by the City of the Commissioning Test Report is a prerequisite to substantial completion of the Contract.	018000	1.05.G							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
6.	Hazardous Materials Abatement and Controls	The Contractor shall submit a Hazardous Materials Management Plan (HMMP with the following documentation listed below. The HMMP shall be submitted within (10) ten days after the Notice to Proceed and before commencement of demolition activities.	021300	1.04.A							
7.	Waterstops	Test reports: Submit test reports showing compliance with performance requirements.	031513	1.04.F							
8.	Waterstops	Material Safety Data Sheet (MSDS): Submit MSDS on waterstop strip primer adhesive.	031513	1.04.G							
9.	Concrete Finishes	Samples: 1. Submit 1/2-pint sample container of aluminum oxide and silicon carbide abrasive grit for review and acceptance where "non-slip finish" is indicated.	033500	1.04.D.1							
10.	Concrete Finishes	Nonslip Finish: Conform to ACI 301. Provide "nonslip finish" for interior pedestrian ramps, walkways, subway cross-passage floors, and other floor areas where indicated.	033500	3.01.C.5							
11.	Glass Fiber Reinforced Concrete	Fire Resistive Rating: Non combustible, UBC Class 1, NFPA Class A, per ASTM E136. Composite Panels shall meet the non-combustible performance criteria of NFPA 285, 2006 edition.	034600	1.03.E							
12.	Concrete Topping	Product Data: Submit manufacturers' product data for nonslip floor ingredients and concrete hardener material.	035300	1.04.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
13.	Concrete Topping	Topping slabs shall receive a "troweled finish" or fine "broom finish" in combination with a "nonslip finish," as selected by the Engineer from Contractor-prepared mock-ups, with “flat” tolerance, as specified in ACI 117.	035300	3.04.C.1							
14.	Metal Fabrications	Product Data: For the following: 1. Nonslip aggregates and nonslip-aggregate surface finishes.	055000	1.04.A							
15.	Metal Fabrications	Structural Performance of Ladders: Aluminum ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.	055000	1.03.B							
16.	Metal Fabrications	For elevator pit ladders, comply with ASME A17.1.	055000	2.09.A.2							
17.	Metal Fabrications	Steel Ladders: Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.	055000	2.09.B.6							
18.	Pipe and Tube Railings	Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated: 1. Handrails and Top Rails of Guards: a. Uniform load of 50 lbf/ ft. applied in any direction. b. Concentrated load of 200 lbf applied in any direction. c. Uniform and concentrated loads need not be assumed to act concurrently.	055213	1.03.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
19.	Metal Stairs	Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated. 1. Uniform Load: 100 lbf/sq. ft. 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.	056000	1.03.B							
20.	Metal Stairs	Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. 1. Component Importance Factor is 1.5.	056000	1.03.D							
21.	Sheathing	Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction. 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory.".	061600	2.01.A							
22.	Membrane Waterproofing For SEM Tunnels	Waterproofing protection plan/narrative and details describing the intended procedures to prevent damage during construction operations such as installation of formwork, reinforcement and embedded items, placement of concrete, application of shotcrete.	071355	1.05.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
23.	Membrane Waterproofing For SEM Tunnels	Material and Safety Data Sheets for all products/materials of membrane waterproofing system.	071355	1.05.F							
24.	Membrane Waterproofing For SEM Tunnels	Membrane: Polyvinyl chloride (PVC), waterproofing membrane or approved equal, of uniform thickness and surface texture. PVC membrane nonreinforced with the following minimum physical properties under respective testing methods: Physical Properties: Flammability Values: self extinguishing Test Method: ASTM D 568	071355	2.01.C							
25.	Membrane Waterproofing For SEM Tunnels	The Contractor shall maintain and distribute to SFMTA written records of test results, repairs, and retesting every time an installation section is completed.	071355	3.03.A.3							
26.	Cold Fluid-Applied Waterproofing	With the submittals specified above, furnish certification and backup documentation signed by an officer of the waterproofing manufacturer stating that the manufacturer has examined the submitted installation drawings and installation instructions and has found them acceptable for all conditions and details reasonably expected in this Contract.	071416	1.05.A							
27.	Cold Fluid-Applied Waterproofing	Waterproofing system shall have the following performance properties: Non-toxic and non-flammable.	071416	2.01.D.6							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
28.	Cold Fluid-Applied Waterproofing	The waterproofing system components shall have the following physical properties: Poly-Rubber Gel Property: Flash Point Requirements: greater than 200 deg F Test Method: ASTM 56	071416	2.01.E							
29.	Cold Fluid-Applied Waterproofing	Areas of the closure wall or portions thereof shall be water tested by means of electronic testing or ponding water to a minimum depth of 2 inches for a period of 48 hours to check the integrity of the waterproofing system installation.	071416	3.08.A							
30.	Thermoplastic Polyolefin (TPO) Roofing	Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.	075423	1.05.B							
31.	Thermoplastic Polyolefin (TPO) Roofing	Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.	075423	1.07.D							
32.	Thermoplastic Polyolefin (TPO) Roofing	Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance according to ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.	075423	1.07.E							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
33.	Fire And Smoke Protection	Materials and installation shall meet or exceed the following requirements: 1. UL or WH Classification and Listing. 2. One-hour, two-hour and three-hour fire ratings when tested in accordance with ASTM E119. 3. Class 1 (25 or less) flame-spread rating when tested in accordance with ASTM E814.	078000	1.05.A							
34.	Fire And Smoke Protection	Provide firestopping and fire-resistant penetration seals wherever require to preserve fire ratings of building elements at plumbing, mechanical, electrical, and other penetrations.	078000	3.02.A							
35.	Spray Applied Fireproofing	Product Data: Submit manufacturer's product data of the cementitious fireproofing material proposed for this work.	078100	1.05.B							
36.	Spray Applied Fireproofing	Certificates: Submit certificates from a testing laboratory acceptable to the Engineer/Architect, attesting that fire protection material and installation methods meet specified fire hazard classifications and fire resistance ratings.	078100	1.05.C							
37.	Spray Applied Fireproofing	At completion of the work, the manufacturer shall submit written certification that fireproofing material was applied over inspected and approved base steel components and that fireproofing material was applied correctly in accordance with these Specifications and the manufacturer's specifications and recommendations.	078100	1.06.C.2							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
38.	Spray Applied Fireproofing	Fire-Retardant Requirements: Fireproofing material shall have been tested, classified, and listed by the Underwriters Laboratories Inc. in accordance with the provisions of ASTM E119. a. Surface Burning Characteristics: Fireproofing material shall have a flamed-spread rating of 10 or less and a smoke-developed contribution of 0 when tested in accordance with ASTM E84.	078100	2.01.A.1							
39.	Intumescent Fireproofing	Certificates: Submit certificates from an independent testing laboratory, attesting that fire protection material and installation methods meet specified fire hazard classifications and fire resistance ratings.	078200	1.06.D							
40.	Intumescent Fireproofing	At completion of the work, the manufacturer shall submit written certification that fireproofing material was applied over inspected and approved base steel components and that fireproofing material was applied correctly in accordance with these Specifications and the manufacturer's specifications and recommendations.	078200	1.07.D.2							
41.	Intumescent Fireproofing	Surface Burning Characteristics: Fireproofing material shall have a flamespread rating of 25 or less when tested in accordance with ASTM E84.	078200	2.02.A.2							
42.	Joint Protection	Fire-Resistant Sealant: Sealants used at penetrations of fire-rated walls and ceiling assemblies shall be UL listed as meeting UL 1479.	079200	2.01.A.5							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
43.	Expansion Control	Fire Rating Certification: Submit copies of UL Classification or Warnock Hersey Listing for fire-rated joint covers.	079500	1.04.C							
44.	Expansion Control	Fire-Rated Joint Assemblies: Install as required to meet fire-rated design and construction. Install fire barriers and flame sealant as required to complete the installation and meet fire-rating requirements.	079500	3.01.B							
45.	Door Hardware	Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams.	080671	1.03.B							
46.	Door Hardware	Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.	080671	1.03.E							
47.	Metal Doors and Frames	Submit certificates of inspection as required for fire-rated doors.	081100	1.04.D.2							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
48.	Metal Doors and Frames	Fire-Rated Doors and Frames: Installation of doors and frames, including hardware and operational characteristics, shall be in accordance with NFPA Standard No. 80, as applicable. Verify that doors and frames are labeled as indicated.	081100	3.01.F							
49.	Access Doors and Panels	Install sidewalk access door as indicated in the Contract Drawings.	083100	3.01.E							
50.	Overhead Coiling Doors	Submit operation and maintenance manual containing printed instructions relative to operation, adjustment, care, and maintenance of the equipment. Include wiring diagrams showing field changes, if any.	083323	1.03.C.3							
51.	Overhead Coiling Doors	Rating: Provide fire-rated roll-up steel doors where indicated on the Contract Drawings.	083323	2.02.K							
52.	Overhead Coiling Doors	All doors shall have over-ride manual operating capability. An emergency hand crank operator shall be provided to operate the door in case of power failure or removal of motor for inspection or servicing. The motor disengaging shall be accomplished by an eye hook using the hand crank.	083323	2.03.E							
53.	Overhead Coiling Doors	Verify that operating controls, manual controls, bypass and safety devices are operating properly.	083323	3.01.C							
54.	Overhead Coiling Grilles	Submit operation and maintenance manual containing printed instructions relative to operation, adjustment, care, and maintenance of the equipment. Include wiring diagrams showing field changes.	083426	1.03.C.3							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
55.	Overhead Coiling Grilles	Perform electrical and manual operation of the security grille, including activating safety interlocks, under the observation of the Engineer, to ensure that grille curtain is free of obstructions and operates smoothly through its full range of travel in both directions.	083426	3.03.A							
56.	Overhead Coiling Grilles	Verify that operating controls, manual controls, bypass and safety devices are operating properly.	083426	3.03.B							
57.	Point-Supported Glazing With Steel Back-Up System	Certificates or test reports demonstrating components and methods have been successfully tested by an independent laboratory in the United States certifying that the proposed system has been tested and as defined by Performance Requirements.	084413	1.05.A.6							
58.	Point-Supported Glazing With Steel Back-Up System	Safety glazing: Comply with Consumer Product Safety Commission 16 CFR 1201, ANSI Z97.1, and other applicable safety requirements. Each piece of safety glazing shall be permanently labeled with appropriate marking.	084413	1.06.E							
59.	Door Hardware	Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	087100	1.05.E							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
60.	Door Hardware	NFPA 101: Comply with the following for means of egress doors: a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation. b. Thresholds: Not more than 1/2 inch high.	087100	1.06.E.3							
61.	Door Hardware	Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C. a. Test Pressure: Positive pressure labeling.	087100	1.06.E.4							
62.	Anti-Static Flooring	3. Slip Resistance: ASTM D2047. Equal to or greater than 0.6.	096318	2.01.A.3							
63.	Resilient Flooring	Linoleum Flooring: ASTM F2034. 1. Flame Spread: 25 maximum when tested in accordance with ASTM E84. 2. Smoke Developed: 450 maximum when tested in accordance with ASTM E662.	096516	2.01.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
64.	Resinous Matrix Terazzo Flooring	Physical Properties with Marble Chips and Aggregates: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide," comply with the following: 1) Flammability: Self-extinguishing, maximum extent of burning 0.25 inch according to ASTM D 635.	096633	2.01.C.3 .b							
65.	Precast Terazzo Stairs	Treads shall have 2 in. minimum band of contrasting ½" wide abrasive slip - resistant strips at all treads;	096700	2.01.A							
66.	Acoustical Vermiculite Cement Plaster	Product Data: Submit manufacturer's product literature and specifications with installation instructions, including certified laboratory test reports confirming materials supplied is non-toxic, contains no asbestos or mineral fibers, and complies with specified requirements..	098314	1.04.B							
67.	Signage	Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.	101410	1.03.C							
68.	Fire Protection Specialties	Product Data: Provide extinguisher operational features, color and finish, and anchorage details. Show relationship of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.	104400	1.04.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
69.	Fire Protection Specialties	Place extinguishers in cabinets prior to Request for Substantial Completion.	104400	3.02.D							
70.	Elevators General	Maintenance and Operating Manuals: Maintenance and operating instructions, including parts lists, for each elevator system. Assemble manuals for component parts into single binders and identify for each elevator.	142000	1.02.D.4							
71.	Elevators General	Fireman's Emergency: Provide Fireman's Emergency Operation Phase I & II in accordance with ASME A17.1 section 2.27.3 Firefighters' Emergency Operation: Automatic Elevators. Elevators to return to main floor via activation of lobby detectors and/or recall switch; include alternate fire operation.	142000	2.04.D							
72.	Elevators General	Card Reader Access: Install card readers in designated elevators as specified to gain access to secured floors, as directed by Engineer. Car calls to designated levels on security will not register without prior activation from coded card to enable activation of floor button(s). Feature can be overridden by Independent or Emergency Service operation.	142000	2.04.E							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
73.	Elevators General	Auto-Return: Provide self-contained battery operated system to automatically return elevator to lowest landing and fully open its doors, upon loss of normal building power. Elevator automatically returns to normal operation upon resumption of normal building power.	142000	2.04.F							
74.	Elevators General	Emergency Communication: Provide for emergency phone in each elevator. Run four (4) pairs of continuous unspliced shielded twisted wire from the emergency phone in the car operating panel to the elevator machine room junction box; junction box provided as part of this work.	142000	2.05.E							
75.	Elevators General	Communication Provisions: Provide as an integral part of car operating panel. Provide emergency communication device with automatic dialer as an integral part of car operating panel; mount operating button, indicator light, and twoway communication speaker in panel, as directed by the Engineer. Engrave emergency summons instructions on panel as directed by the Engineer.	142000	2.06.D							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
76.	Elevators General	Fire Recall Switch and Emergency Power Signage: Incorporate fire recall switch and illuminated sign into hall button fixture for each group of elevators; fixture assembly to include fire recall switch, emergency power signage, and call button(s). Fixture to be single faceplate design with operating instructions on faceplate. Size, configuration, arrangement and engraving of graphics on faceplate as directed by the Engineer.	142000	2.06.H							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
77.	Elevators General	Fire Command Station: 1. General: Provide indicator panel as specified; connection between elevator controller panels and remote station via station network. Design, finish, indications, and arrangement of panel as directed by the Engineer. Engrave operating instructions for controls and indications. Provide wall-mounted panel, with stainless steel faceplate; location and size as directed by Engineer. 2. Include the following: a. Fireman's Service: Indication of activation of recall switch or smoke detector with pilot light for each group of elevators. Include indication of activation of Fireman's Service switch in each elevator and separate light for each elevator to indicate elevator has returned to the recall floor with its doors open. b. Position Indicator: Provide indicator showing location of each elevator and direction of travel. c. In-Out of Service: Provide indication for each elevator showing if elevator is in or out of service. d. Standby Power: Provide indication for each bank of elevators an activation of the Emergency Power system.	142000	2.06.J							
78.	Elevators General	Provide Braille/Arabic indications as shown and specified; submit samples.	142000	2.07.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
79.	Elevators General	1. Safety Device: Provide manufacturer's standard electronic safety edge with minimum of forty (40) light beams. Edge to extend full height of opening. Locate to ensure device is not damaged when door edge is struck. 2. Operation: Protect door opening with multiple light beams covering the entire door opening; arrange to reopen doors when beam(s) are interrupted, reestablishing beam(s) permits doors to close. Doors remain open as long as light beam(s) is interrupted. Provide nudging feature to close doors at reduced speed and sound buzzer on car when doors are prevented from closing for fifteen seconds; time to be adjustable from five seconds to one minute. Provide adjustable passenger transfer door dwell times.	142000	2.08.B							
80.	Elevators General	Light Level: Provide minimum of 15 foot-candles, measured 4 feet above car floor.	142000	2.09.B.1.a							
81.	Elevators General	Emergency Lighting: Provide system incorporating a self-contained battery system on car top with charger to maintain battery power; system to be capable of operating lights for a minimum of four hours. System illuminates normal car fixtures or locates separate light fixture out of public view above car ceiling.	142000	2.09.M							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
82.	Elevators General	Acceptance Testing: On completion of the elevator installation and before permitting use, either temporary or permanent, of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.	142000	3.03.A							
83.	Electric Traction Elevators	Carframe, Safety and Governor: 2. Safety: Type B, flexible guide clamp.	142100	2.03.G							
84.	Hydraulic Elevators	Roped Design: b. Safety: Type A.	142400	2.03.G.2							
85.	Escalators	Maintenance and Operating Manuals: Maintenance and operating instructions, including parts lists, for each escalator system. Assemble manuals for component parts into single binders and identify for each type and size of escalator.	143100	1.03.D.4		Leave in.					
86.	Escalators	Failure Mode and Effects Analysis: Provide six (6) copies of a Failure Mode Analysis and Effects Analysis for all escalator safety circuits and components, including, but not limited to: steps, brakes, and step and axle rollers and any other components which could affect rider safety.	143100	1.03.D.5							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
87.	Escalators	Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and Municipal authorities having jurisdiction. 1. ASME A17.1 American National Standards 2. CCR Title 8 Elevator Safety Orders 3. CCR Title 24 State Building Code 4. CBC California Building Code 5. ADA Americans with Disabilities Act	143100	1.04.A							
88.	Escalators	Brake: Provide an electrically released and mechanically or magnetically applied brake per Code. The Service and auxiliary brake to have a deceleration rate of not more than three (3) feet per second squared. Design for a maximum accumulated static and dynamic load for the total number of exposed steps on the incline, in accordance with ANSI A17.1.	143100	2.04.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
89.	Escalators	The Remote Control Inspection Station to include an emergency stop switch (maintained-contact selector switch), and UP direction push button (momentary contact only when button is held down) and a DOWN direction push button (momentary contact) housed in a stainless steel enclosure and connected to a 20 foot long Tyrex cord (number of conductors as required) with multi conductor plug with a protective screw cap and retainer chain suitable for use in corrosive areas. Provide two (2) complete stations.	143100	2.04.D.4							
90.	Escalators	Switches to be self-resetting and control circuits arranged so that after a switch is tripped it will be impossible to start escalator until safety switch or switches are reset.	143100	2.05.A							
91.	Escalators	Starting Switches: Provide spring return type key operated starting switches for manual starting, located at landings so all the steps are within sight.	143100	2.05.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
92.	Escalators	Emergency Stop Button and Starting Switch: Provide emergency stop button and starting switch at the lower and upper newel ends in a single housing; material and finish to match adjacent finish. Emergency stop button designated red and protected against accidental contact; cover to be unlocked and readily removable for access. Cover to be marked EMERGENCY STOP; LIFT COVER; PUSH BUTTON. Letters shall be minimum 1/2-inch high for EMERGENCY STOP and 3/16-inch for other wording. Function and operating positions of switches and buttons to be identified with engraved characters which are visible from the standing position. Starting switch to be spring return type and emergency stop button to be push type.	143100	2.05.C							
93.	Escalators	Governor: Provide speed governor to interrupt power to the drive machine in the event the speed of the steps exceeds allowable limits per code; governor to be manual reset type.	143100	2.05.D							
94.	Escalators	Broken Step Chain Device: Provide a broken step chain device which causes interruption of power to the drive machine if a step chain breaks; device to be manual reset type.	143100	2.05.E							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
95.	Escalators	Broken Drive Chain Device: Provide a broken drive chain device which causes application of the brake on the main drive shaft and stops the escalator if the drive chain parts; device to be manual reset type.	143100	2.05.F							
96.	Escalators	Machine Area Stop Switch: Provide a machine area stop switch, which causes interruption of power to the drive machine and brake, where access is provided.	143100	2.05.G							
97.	Escalators	Reversal Device: Provide a reversal stop device which causes interruption of power at the drive machine motor and brake in the case of accidental reversal of travel in the up direction; device to be manual reset type.	143100	2.05.H							
98.	Escalators	Up-Thrust Device: Provide a step up-thrust device which causes interruption of the power at the drive machine motor and brake should a step be dislodged against the up-thrust track at the lower curve.	143100	2.05.I							
99.	Escalators	Step Level Device: Provide a step level device located at the top and bottom of the escalator. Device to detect step movement displacement of 1/8-inch or greater at the riser end at either side of the step. When activated, device causes escalator to stop prior to the step entering the combplate; device to be manual reset type.	143100	2.05.J							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
100.	Escalators	Drive Connector Device: Provide a device which applies the brake in the event the drive motor becomes disconnected from the gear box, provided the drive motor is attached by means other than a continuous shaft, coupling or toothed gearing; device to be manual reset type.	143100	2.05.K							
101.	Escalators	Handrail Speed Monitoring Device: Provide a handrail speed monitoring device that causes activation of the alarm whenever the speed of either handrail deviates from the step speed by more than 15%. Device to interrupt power to the drive machine motor and brake in the event over speeding continues for more than 2 seconds; device to be manual reset type.	143100	2.05.L							
102.	Escalators	Handrail Switch: Provide a handrail entry device at each newel. Operation to be in the entry direction only. Device to be manual reset type. The device interrupts the power to the drive machine motor and brake if either, an object becomes caught between the handrail and the guard, or an object approaches the area between the handrail and the guard.	143100	2.05.M							
103.	Escalators	Missing Step Device: Provide a missing step device that detects a missing step and stops the escalator prior to the gap from the missing step exiting the combplate; device to be manual reset type.	143100	2.05.N							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
104.	Escalators	Comb-Step Device: Provide a comb-step impact device; device to be manual reset type. The device interrupts the power to the drive machine motor and brake if either, a horizontal force in the direction of travel is applied exceeding 112 lb/ft at either side or exceeding 225 lb/ft at the center of the front edge of the combplate, or a resultant vertical force in the upward direction is applied exceeding 150 lb/ft at the center of the front of the combplate.	143100	2.05.O							
105.	Escalators	Demarcation Lights: Provide green step demarcation lights located below the steps at the lower and upper landing; three fluorescent lamp fixtures as a minimum at each landing. Arrange lamp fixtures parallel to the combplate (leading edge) with the first lamp located directly below the teeth line. Space lamps accordingly between the side edges of the steps and the skirt panel. Lights to be UL labeled.	143100	2.05.P							
106.	Escalators	Skirt Obstruction Device: Provide skirt obstruction device which causes interruption of the power if an object is accidentally engaged between the step and skirt, as the step approaches the combplate.	143100	2.05.Q							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
107.	Escalators	Defective Roller Detector: Install a total of four (4) proximity type switches on both left and right hand sides at the rack and axle rollers in order to detect defective rollers with no load on the steps.	143100	2.05.R							
108.	Escalators	Fault Finders: Provide a suitable electronic fault finding system with memory for each escalator to indicate source of trouble, should there be a failure of any components. Fault finders to be readily accessible and separately identify each safety device in case of failure.	143100	2.05.S							
109.	Escalators	Maintenance Gates: Provide electrical interlock at maintenance gates for the upper and lower ends of the escalator, so in the event gate(s) are in the open position escalator will not run.	143100	2.05.T							
110.	Escalators	Grounding: In addition to all other grounding requirements, provide truss with independent grounding to nearest structural steel with 4/0 wire.	143100	2.06.D							
111.	Escalators	Signs: Provide Hold Handrail and Warning signs at each landing. Signs to be approximately 4-inches wide by 7½-inches long and include all code required graphics.	143100	2.07.L							
112.	Sprinklers	Sprinkler System: As required by code, provide internal sprinkler line along entire length of truss with stub-outs for sprinklers. Sprinkler line to exit truss at upper end of escalator. System to be pressure tested in the factor and capped to prevent contamination of system.	143100	2.07.M							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
113.	Sprinklers	Instructions: Instruct the Engineer's personnel in proper use, maintenance, adjustment, and repair of each system. Provide a minimum of two (2) instructors for a period of two (2) days.	143100	3.04.E							
114.	Identification For Plumbing And Fire Suppression System	San Francisco Fire Department (SFFD) Documentation: Submit draft and SFFD documentation, including drawings/maps, to the Engineer. A copy of the draft submittal shall be reviewed and approved by the Engineer prior to the submittal to the SFFD. An electronic version of the drawings/maps (in AutoCAD 2010 version) shall be included with the submittals along with hard copies.	201413	1.03.D							
115.	Identification For Plumbing And Fire Suppression System	Control Valve Drawing/Map: Provide a legible, laminated drawing/map along with an isometric piping drawing of the location of all control valves, along with indication of what they control, shall be provided on the wall at a location approved by the SFFD. The drawing/ map and isometric drawings shall be reviewed and approved by the SFFD.	201413	2.01.G							
116.	Fire-Suppression Standpipes	1. All fire protection piping shall be adequately restrained to resist seismic forces in accordance with NFPA 13. All equipment anchors shall be designed for a Zone 4 seismic event.	211200	1.04.A							
117.	Fire-Suppression Standpipes	Certified Test Reports: Submit certified test reports of aboveground and underground piping as indicated in NFPA 13.	211200	1.04.E							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
118.	Fire-Suppression Standpipes	Operation and Maintenance Data: Submit operation and maintenance data for the equipment and system provided, in accordance with Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	211200	1.04.F							
119.	Fire-Suppression Standpipes	Permits: Obtain all necessary permit(s) from the San Francisco Department of Building Inspection and the San Francisco Fire Department for the work described in this specification. Contractor is responsible for paying all permit fees.	211200	1.04.G							
120.	Fire-Suppression Standpipes	San Francisco Fire Department (SFFD): Separate Shop Drawings of the drywetted standpipe system shall be submitted to the SFFD for approval. A copy of the submittal shall be reviewed and approved by the Engineer prior to submittal to the SFFD. Approval shall be obtained before beginning installation work. The Contractor shall submit a copy of the SFFD approved shop drawings for the Engineer's information.	211200	1.04.I							
121.	Fire-Suppression Standpipes	Seismic restraints, anchorages and reinforcements shall be provided for equipment and piping in accordance with the California Building Code, NFPA 13 and Appendix A, NFPA 14 and San Francisco code standards and regulations. Equipment and piping shall be anchored to withstand forces generated by earthquake movement.	211200	2.06.B.1							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
122.	Fire-Suppression Standpipes	The Contractor shall perform all tests in the presence of the Engineer and shall furnish all items used in testing. The Contractor shall give 48-hour notice prior to test. The Engineer will review certificates and test reports, and will inspect the standpipe system to verify conformance with NFPA 14. Test shall be witness by authority having jurisdiction.	211200	3.04.C							
123.	Wet-Pipe Sprinkler Systems	O & M Data: Submit operation and maintenance data for the equipment and system provided, in accordance with Section 01 78 23, Operation and Maintenance Data. Include recommended spare parts list.	21313	1.04.E							
124.	Wet-Pipe Sprinkler Systems	Permits: Obtain all necessary permit(s) from the San Francisco Department of Building Inspection and the San Francisco Fire Department for the work described in this specification. Contractor is responsible for paying all permit fees.	21313	1.04.F							
125.	Wet-Pipe Sprinkler Systems	Certified Test Reports: Submit certified test reports on Contractor's Material and Test certificate for aboveground and underground piping as shown in NFPA 13.	21313	1.04.H							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
126.	Wet-Pipe Sprinkler Systems	Provide undercar deluge systems for underground station. Contractor shall design, furnish and install a complete mechanically, electrically functional undercar deluge system. Provide all piping, control panels, wiring, valves, and other materials and accessories for a complete operating system approved and accepted by SFFD.	21313	2.02.A							
127.	Wet-Pipe Sprinkler Systems	The undercar deluge systems, four zones per track, shall be hydraulically designed and installed in accordance with NFPA 13, 15 and California Building Code Section 433. The systems shall be designed for remote manual activation by SFMTA Operations Control Center (OCC) and Transportation Management Center (TMC). Deluge system control panels shall be located at the opposite ends of the station platform as shown on the Contract Drawings.	21313	2.02.B							
128.	Wet-Pipe Sprinkler Systems	Seismic restraints, anchorages and reinforcements shall be provided for equipment and piping in accordance with the California Building Code, NFPA 13 and Appendix A, NFPA 14 and San Francisco code standards and regulations.	21313	2.05.B.1							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
129.	Wet-Pipe Sprinkler Systems	The Contractor shall perform all tests in the presence of the Engineer and shall furnish all items used in testing. The Contractor shall give 48 hour notice prior to test. The Engineer will review certificates and test reports, and will inspect the automatic sprinkler system to verify conformance with NFPA 13.	21313	3.04.C							
130.	Wet-Pipe Sprinkler Systems	Refer to Section 01 79 00, Demonstration and Training, for maintenance personnel training requirements.	21313	3.05.B							
131.	Clean-Agent Fire Extinguishing Systems	Seismic calculations: All clean agent piping and equipment shall be adequately restrained to resist seismic forces in accordance with NFPA 13. All equipment anchors shall be designed for a Zone 4 seismic event.	212200	1.05.B.3							
132.	Clean-Agent Fire Extinguishing Systems	Calculations shall submitted demonstrating that the proposed system can provide the design concentration within the design discharge time. Submit design calculations bearing stamp of approval of authority having jurisdiction.	212200	1.05.B.6							
133.	Clean-Agent Fire Extinguishing Systems	San Francisco Fire Department (SFFD): Shop Drawings of the clean agent fire suppression system shall be submitted to the Engineer for approval prior to submission to the SFFD for approval. Shop Drawings require approval of the SFFD before any installation work may begin.	212200	1.05.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
134.	Clean-Agent Fire Extinguishing Systems	Certificates of Compliance: Submit such certified test reports for materials and equipment to demonstrate compliance with specification requirements.	212200	1.05.D							
135.	Clean-Agent Fire Extinguishing Systems	Product Data: Material and equipment information shall include manufacturer's catalog cuts and technical data for each of the following components or devices used in the system and shall bear stamp of authority having jurisdiction: 1. Smoke sensors; 2. Manual discharge switches (pull stations) with digital countdown timer; 3. Control panel; 4. Release devices; 5. Alarm devices; 6. Storage containers; 7. Mounting brackets; 8. Nozzles; 9. Abort stations; and 10. Contact monitor modules.	212200	1.05.E							
136.	Clean-Agent Fire Extinguishing Systems	Operation and Maintenance Data: Submit operation and maintenance data for the equipment and system provided in accordance with Section 01 78 23 – Operation and Maintenance Data. Include recommended spare parts list.	212200	1.05.F							
137.	Clean-Agent Fire Extinguishing Systems	Certified Test Reports: Submit certified test reports that indicate successful completion of all tests performed as required by Article 3.04 herein.	212200	1.05.H							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
138.	Clean-Agent Fire Extinguishing Systems	Manufacturer: Certify that system meets or exceeds specified requirements and NFPA 2001.	212200	1.05.I							
139.	Clean-Agent Fire Extinguishing Systems	Once the clean-agent fire extinguishing system is completed installed at an underground station, the Contractor shall obtain final approval from the SFFD to operate each system by completing the testing and paperwork required by the SFFD. Contractor shall submit all final SFFD approval documentation to the Engineer.	212200	1.06.J							
140.	Clean-Agent Fire Extinguishing Systems	All tests shall be conducted in accordance with NFPA 2001 as approved by the SFFD.	212200	3.04.A							
141.	Clean-Agent Fire Extinguishing Systems	System Tests: Tests shall demonstrate that the operation and installation requirements of this specification have been met. Submit certified copies of tests as specified in Article 1.06.G herein.	212200	3.04.B							
142.	Clean-Agent Fire Extinguishing Systems	Functional Tests: Tests shall demonstrate that the entire control system functions as designed. All circuits shall be tested including automatic discharge, manual discharge, and equipment shutdown and alarm devices. In addition, supervision of each circuit shall be tested.	212200	3.04.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
143.	Clean-Agent Fire Extinguishing Systems	Design Review Test: Take field measurements of the room, and field calculate the amount of clean agent required to reach the design criteria, and match against the contents of the clean agent storage containers.	212200	3.04.D							
144.	Clean-Agent Fire Extinguishing Systems	Pressurization Test: Conduct a door fan test to determine the overall containment capacity of the clean agent protected area, and equivalent leakage area of the room. The calibrated fan unit shall be used to pressurize or depressurize the area with all air conditioning shutdown and dampers closed, and monitor airflow versus pressure data. The results shall be used to calculate a pass or non-pass conclusion. A manufacturer-approved testing unit and program shall be used for this test.	212200	3.04.E							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
145.	Clean-Agent Fire Extinguishing Systems	Piping Test Review: Make a field verification of the piping network and match against the drawing flow calc. All significant variations will require recalculation of the piping system. 1. A distribution piping and valve, prior to nozzle installation pressurization test shall be conducted that requires 150 psi to be held for 10 min with no more than 10 percent pressure drop. Inspect joints using soap water solution or halide torch or lamp, replace and retest. 2. A “puff” test using dry nitrogen shall be conducted. Caps shall be placed over all discharge nozzles and adequate pressure shall be supplied to demonstrate that all of the caps will blow off indicating that the pipes are free of obstructions. 3. Upon completion of installation provide final checkout inspection by factory-trained representative of manufacturer to ascertain proper system operation. Leave system in a fully commissioned and automatic readiness state with circuitry energize and supervised. 4. Submit original copies of test, indicating that factory trained technical representatives of the manufacture have inspected and tested systems and are satisfied with methods of installation, connections and operations.	212200	3.04.F							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
146.	Clean-Agent Fire Extinguishing Systems	Training Requirements: Provide complete system operation training of at least two four-hours training for twelve of the SFMTA's personnel in accordance with Section 01 79 00 - Demonstration and Training, and as scheduled with the Engineer.	212200	3.05.A							
147.	Facility Water Distribution	Before final acceptance of the water supply system, each section of the new line shall be disinfected in accordance with AWWA C651. One of the following sources of disinfectant shall be used: 1. Mixture of water and chlorine gas; 2. Direct application of chlorine; or 3. Mixture of water and calcium hypochlorite.	221100	3.03.A							
148.	Facility Storm Drainage	Test Reports: Submit certified test results and certificates of compliance as necessary to verify conformance with specified requirements.	221400	1.04.F							
149.	Sump Pumps	Submit maintenance and operating data in accordance with Section 01 79 00, Training Programs and Operations & Maintenance Manuals. Include detailed parts lists, lists of recommended spare parts, lubrication and maintenance procedures, troubleshooting procedures, and operating instructions.	221429	1.04.D							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
150.	Sump Pumps	Once the water reaches pre-determined level, which exceeds pump capacity, the sump pump system shall send an alert signal to SFMTA Chief Stationary Engineer Office or his Designee using SFMTA data network system.	221429	2.02.B.2							
151.	Sump Pumps	Refer to Section 01 79 00, Training Programs and Operations & Maintenance Manuals, for training of SFMTA maintenance personnel requirements.	221429	3.02.A							
152.	Sump Pumps	Prior to testing, submit to the Engineer for approval, test procedure along with manufacturer's recommendations for startup and test.	221429	3.03.B							
153.	Sump Pumps	Field test shall demonstrate work quality, operation, and performance. Each test attribute shall be completed in the order listed below to the satisfaction of the Engineer. Submit a written record indicating that the items listed have been completed.	221429	3.03.D							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
154.	Air Replenishment System	Shop Drawings: Submit Shop Drawings and Calculations to include the following requirements: 1. Pressure calculations (calculations must demonstrate that all pressure components meet the design criteria of this Section plus a minimum safety factor of 25 percent); 2. Seismic calculations: All air replenishment piping shall be adequately restrained to resist seismic forces in accordance with NFPA 13. All equipment anchors shall be designed for a Zone 4 seismic event.	221601	1.04.B							
155.	Air Replenishment System	O&M Data: Submit operation and maintenance data for the equipment and system provided, in accordance with Section 01 79 00, Training Programs and Operations & Maintenance Manuals. Include recommended spare parts list.	221601	1.04.F							
156.	Air Replenishment System	San Francisco Fire Department (SFFD): Separate Shop Drawings of the air replenishment system shall be submitted to the SFFD for approval. A copy of the submittal shall be reviewed and approved by the Engineer prior to submittal to the SFFD. Approval shall be obtained before beginning installation work. The Contractor shall submit a copy of the SFFD approved shop drawings for the Engineer's information.	221601	1.04.G							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
157.	Air Replenishment System	Permits: Obtain all necessary permit(s) from the San Francisco Department of Building Inspection and SFFD for the installation, testing and operation of the air replenishment system.	221601	1.04.H							
158.	Air Replenishment System	The air replenishment system must be designed by a qualified designer under the supervision of a California licensed Mechanical Engineer. Drawings and calculations shall be signed and stamped by a California licensed Mechanical Engineer.	221601	1.05.A							
159.	Air Replenishment System	Furnish and install fire department key box containing a key to the air replenishment system exterior fire department connection panel shown on Contract Drawings. The key box shall be a TRAC-Vault by UTC Fire and Security as required by the SFFD.	221601	2.02.A							
160.	Air Replenishment System	Provide and install the following system component to each panel: 1. One male fitting that is compatible with the SFFD mobile air unit. 2. One downstream shutoff valve. 3. One pressure gauge to read the pressure of the piping distribution system to air filling stations. 4. One pressure gauge to read the supply pressure from SFFD mobile air unit. 5. One pressure relief valve designed to limit the pressure that can be introduced to system to not more than the necessary to achieve the bottle filling design criteria.	221601	2.03.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
161.	Air Replenishment System	Provide and install the following system component to each cabinet: 1. One isolation valve located between the air discharge line to the next air substation and the downstream line to the air base station supply or the air substation immediately below to the next substation above the air base station. 2. The fill hoses and isolation valves shall be installed between the air bottle connection line and the fresh air supply. 3. Excess bleed valves shall be located between the air bottle fill hose and the next air substation. 4. Each fill station shall contain two fill hoses/fittings that are provided with a pressure regulating valve to equalize pressure between two bottles. The filling of two bottles shall be controlled by a single control valve between the air supply and air bottle.	221601	2.04.D							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
162.	Air Replenishment System	Pressure Monitoring Switch and Door Switch: An electric low pressure monitoring switch shall be installed in the piping system to monitor the air pressure as indicated in the Contract Drawings. A door switch shall be installed at exterior fire department connection panel to monitor the opening of the panel door. The pressure switch and door switch shall both be connected to the building's fire alarm system via a monitor module. The pressure switch and door switch shall transmit a supervisory signal to the station fire alarm control panel provided under Section 28 31 11 – Digital, Addressable Fire Alarm System, respectively, when the pressure of the breathing air system is less than 3,000 psig at 70 degrees F, plus or minus 100 psig, or when the exterior fire connection panel door is opened.	221601	2.05.G							
163.	Air Replenishment System	Fire department connection panels shall be clearly labeled "FIREFIGHTER'S AIR SYSTEM" in letters 2 inches in height with a 3/8-inch brush stroke;	221601	3.03.B							
164.	Air Replenishment System	System will be inspected and tested in accordance with San Francisco Fire Department Bulletin 5.07 for compliance with these Specifications.	221601	3.04.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
165.	Air Replenishment System	During the system final test, after the system is pressurized with air from a certified compressor, two air samples shall be taken from the lowest and highest air filling panels, and submitted to an accredited testing laboratory that meets the requirements for air filling specified in Chapter 4 of NFPA 1989. Copies of laboratory testing report shall be provided to the Engineer and the district fire inspector prior to the issuance of the Certification of the Final Completion for station. Contractor shall submit a copy of the Certification of Final Completion to the Engineer.	221601	3.04.D							
166.	Air Replenishment System	During the system final test, after the system is pressurized with air from a certified compressor, two air samples shall be taken from the lowest and highest air filling panels, and submitted to an accredited testing laboratory that meets the requirements for air filling specified in Chapter 4 of NFPA 1989. Copies of laboratory testing report shall be provided to the Engineer and the district fire inspector prior to the issuance of the Certification of the Final Completion for station. Contractor shall submit a copy of the Certification of Final Completion to the Engineer.	221601	3.04.D							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
167.	Plumbing Fixtures	Emergency Eyewash (P-6): Provide emergency eyewash with post mounted design incorporating the following components: [items 1 – 6]	224000	2.02.A							
168.	Noise, Vibration, And Seismic Control	Seismic Bracing Where pre-approved bracing systems will be employed, submittals shall include: a. Approval identification number. b. System component brochure describing components used and detailed installation instruction. c. Loads to be transmitted to structure at anchor point.	230548	1.06.B.1							
169.	Noise, Vibration, And Seismic Control	Seismic Bracing Where anchorage, support and bracing are not detailed on the drawings and pre-approved systems are not used, Contractor shall submit designs and calculations of proposed systems. Submittals shall include: a. Detailed sketches showing system to be installed, stamped and signed by a California registered Structural Engineer.	230548	1.06.B.2							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
170.	Noise, Vibration, And Seismic Control	Contractor shall submit details and calculations for all embedded inserts, drilled inserts and other fasteners for attachments of suspended components showing the load-carrying capacity of each device calculated in accordance with Chapter 16 of the California Building Code. The calculations shall include the same certification and engineer's stamp as required above for seismic bracing.	230548	1.06.E.4							
171.	Testing, Adjusting and Balancing For HVAC	Testing of Fire and Smoke Dampers: 1. Test all fire and smoke dampers for proper operation. Test in accordance with local Fire Marshal requirements. 2. Provide documentation of testing indicating date of test, individuals present during testing, and pass or fail for each damper and duct detector. System testing shall not be complete until record indicates that all dampers and duct detectors have passed the test.	239305	3.03.H							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
172.	HVAC Insulation	Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per American Society for Testing and Materials ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency. 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke developed index of 50 or less. 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.	230700	1.03.A							
173.	HVAC Insulation	Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by a NRTL acceptable to authority having jurisdiction.	230700	2.02.A							
174.	HVAC Insulation	Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.	230700	3.03.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
175.	HVAC Insulation	Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.	230700	3.08.A							
176.	HVAC Insulation	Insulate duct access panels and doors to achieve same fire rating as duct.	230700	3.08.B							
177.	HVAC Insulation	Install firestopping at penetrations through fire-rated assemblies.	230700	3.08.C							
178.	Commissioning of HVAC	DRAFT Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled: [items 1 – 6]	230800	1.06.D							
179.	Commissioning of HVAC	Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Engineer.	230800	1.06.E							
180.	Commissioning of HVAC	HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at a minimum the following data on the control system: [items 1 – 13]	230800	1.06.F		Leave in.					
181.	Commissioning of HVAC	Training Manuals: See Section 01 79 00, Training Programs and Operations & Maintenance Manuals, for additional requirements. 1. Provide 6 extra copies of the controls training manuals in a separate manual from the Operations & Maintenance (O&M) manuals.	230800	1.06.I							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
182.	Commissioning of HVAC	Control System Functional Testing Demonstrate to the Engineer: [items 1 – 19]	230800	3.05.G							
183.	Commissioning of HVAC	Perform and submit trend logging on the following using the control system, for minimum period of 5 days including one weekend, if the control points are monitored by the control system: 1. Duty cycling, if specified. 2. Demand limiting, including over-ride of limiting. 3. Sequential staging ON of equipment; optionally demonstrate manually. 4. Optimum start-stop functions.	230800	3.05.H							
184.	Commissioning of HVAC	Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Refer to specific specification sections for training durations. Provide the following minimum durations of training: 1. HVAC Control System: 8 hours. 2. Variable Volume Refrigeration: 4 hrs 3. Central Station Air Supply and Exhaust Handling Systems: 4 hours. 4. Piping Systems: 2 hours. 5. Variable Speed Drives: 1 hour. 6. Return Fan/Relief Fan: 1 hour. 7. Air Terminal Units: 2 hours. 8. Split System AC or Heat Pumps: 1 hr.	230800	3.07.D							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
185.	Commissioning of HVAC	TAB Review: Instruct Owner's personnel for minimum 8 hours, after completion of TAB, on the following: 1. Review final TAB report, explaining the layout and meanings of each data type. 2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water. 3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity. 4. Discuss any temporary settings and steps to finalize them for any areas that are not finished. 5. Other salient information that may be useful for facility operations, relative to TAB.	230800	3.07.E							
186.	Commissioning of HVAC	HVAC Control System Training: Perform training in at least three phases: 1. Phase 1 - Basic Control System: Provide minimum of 8 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.	230800	3.07.F.1							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
187.	Commissioning of HVAC	Phase 2 - Integrating with HVAC Systems: Provide minimum of 8 hours of on-site, hands-on training after completion of Functional Testing. Include instruction on: [items a – j]	230800	3.07.F.2							
188.	Instrumentation and Control for HVAC	Provide an alarm notification and escalation plan that includes all alarms and their notification schemes for all application and system alarms. The plan shall include all alarm points, their class, priority and their point(s) of annunciation such as email, page and visual data archive points such as printers and logs. At a minimum the following alarms shall be implemented: a. Status alarm for all devices that have a Start/Stop and Status. The alarms shall cover any discrepancy in status for more than a specified time period. The time period shall be appropriate for the application. b. Any Set-points not met by a selectable deviation (either in % of full range or absolute value) for more than a specified time period. The time period shall be appropriate for the application. c. Discrete Alarm Points, shown on the points list. d. The alarms with the highest priority shall remain on top of the list.	230913	1.04.B.12							
189.	Instrumentation and Control for HVAC	The installed system shall provide secure password access to all features, functions and data contained.	230913	2.01.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
190.	Instrumentation and Control for HVAC	Sensors Hydrogen Sensor [items 1 – 18]	230913	2.14.I							
191.	Instrumentation and Control for HVAC	All controllers and network equipment for the BAS system shall be powered by a permanent UPS, sized to provide power for at least five minutes to all control equipment in the panel in case of a power failure.	230913	3.02.A.2							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
192.	Instrumentation and Control for HVAC	The training shall be in three sessions as follows: 1. Initial Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. Instruction & Operations manuals shall have been submitted at least two weeks prior to training so that SFMTAs' personnel can start to familiarize themselves with the system before classroom instruction begins. 2. First Follow-Up Training: Two days (16 hours total) approximately one months after conclusion of the functional performance test but before formal acceptance. These sessions will deal with more advanced topics and answer questions from the users. 3. Warranty Follow Up: Two days (16 hours total) in no less than 4 hour increments, to be scheduled at the request of SFMTA during the one year warranty period. These sessions shall cover topics as requested by SFMTA such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.	230913	3.09.C							
193.	Instrumentation and Control for HVAC	Three copies of the Operation & Maintenance manuals for work provided under this Division shall be provided to SFMTA upon completion of the project.	230913	3.12.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
194.	Sequence of Operations for HVAC Controls	SV-1 Any smoke event in the supply duct shall shut down the unit. The unit shall restart automatically once the alarm has been cleared on the fire alarm system.	230993	1.04.C.1							
195.	Sequence of Operations for HVAC Controls	EV-1 Any smoke event in SV-1 shall shut down the unit. The unit shall restart automatically once the alarm has been cleared on the fire alarm system.	230993	1.05.C.1							
196.	Sequence of Operations for HVAC Controls	The Battery charging stations shall be disabled whenever the either SV-1 or EV-1 are not operational.	230993	1.10.A							
197.	Sequence of Operations for HVAC Controls	Duct air flow switches in exhaust terminal units shall provide proof of flow to the Fire Alarms System.	230993	1.10.B							
198.	Sequence of Operations for HVAC Controls	Hydrogen sensors shall annunciate an alarm on the GUI whenever the concentration reaches the alarm limit of 1% (Adj.)	230993	1.10.C							
199.	Sequence of Operations for HVAC Controls	Whenever the battery charging system is active, the sequence of operation for all associated terminal units shall be as follows: 1. Maintain a minimum of 1.0 cfm /sf ventilation rate in the battery charging room. This minimum rate shall have priority over space temperature airflow requirements 2. Increase the rate of exhaust by 10% over supply airflow whenever the battery system is in charging mode 3. Resume normal operation once the battery systems is no longer in charging Mode.	230993	1.10.D							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
200.	Refrigerant Piping	Operation and Maintenance Data: Submit operation and maintenance data for equipment provided, in accordance with Section 01 78 39, Project Record Documents.	232300	1.05.D							
201.	Refrigerant Piping	Provide training of the SFMTA's personnel on procedures and schedules related to start-up and shut-down, troubleshooting, servicing, and preventive maintenance of refrigerant piping valves and refrigerant piping specialties in accordance with Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	232300	3.04.B							
202.	HVAC Ducts and Casings	Product Data: Submit manufacturers' product data and certificates of compliance for specified materials and equipment including but not limited to the following: 1. Backdraft dampers. 2. Volume dampers. 3. Fire dampers. 4. Ceiling fire dampers. 5. Smoke dampers. 6. Combination fire and smoke dampers.	233100	1.04.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
203.	HVAC Ducts and Casings	Fire dampers shall be UL Class A rating and constructed in accordance with UL 555S and SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems. Fusible links on fire dampers shall be constructed in accordance with UL 33. Provide fire dampers in accordance with NFPA 90A where ducts and outlets pass through fire-rated walls, and where indicated.	233100	2.05.A							
204.	HVAC Ducts and Casings	Fire dampers shall be curtain type and fabricated of galvanized steel, weighted to close and remain in closed position when released by fusible link. Fabricate fire dampers with linkage readily adjustable with damper in open position.	233100	2.05.B							
205.	HVAC Ducts and Casings	Set or select fusible links for 165 degrees F release unless otherwise indicated.	233100	2.05.C							
206.	HVAC Ducts and Casings	Combination Fire/Smoke Damper Electric Fuse Link: Resettable from outside the duct and ensures controlled closure of damper, 165 degrees F. UL listed and labeled.	233100	2.06.F							
207.	HVAC Ducts and Casings	Combination Fire/Smoke Damper Test Switch: To test and cycle damper on location with open and closed indicator lights.	233100	2.06.G							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
208.	HVAC Ducts and Casings	Combination Fire/Smoke Damper Damper shall be capable of interfacing electrically with a smoke detector and remote indicating/ control station. Where indicated, provide conventional fusible link connection between damper and operator instead of a firestat.	233100	2.06.H							
209.	HVAC Ducts and Casings	Perform inspections, as necessary, to ensure compliance with NFPA standards and SMACNA HVAC Duct Construction Standards - Metal and Flexible, witnessed by the Engineer. Conduct inspection in accordance with SMACNA HVAC Duct Systems Inspection Guide. Results of inspections shall be documented and submitted for review.	233100	3.03.F							
210.	HVAC Fans	Operation and Maintenance Data: Submit manufacturer's operation and maintenance instructions in accordance with Section 01 79 00, Training Programs and Operation & Maintenance Manuals. Include parts and special tools lists.	233400	1.05.D							
211.	HVAC Fans	Test Reports: Submit certified test reports for the fans and field test results for installed products.	233400	1.05.E							
212.	HVAC Fans	Central Exhaust Fans that are providing battery area exhaust: Provide with explosion-proof motors and spark-proof construction, AMCA 99-0401, type B. Epoxy coat inside of fan housing.	233400	2.01.J							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
213.	HVAC Fans	Provide instructions to the SFMTA's maintenance personnel on proper operation and maintenance procedures in accordance with Section 01 79 00, Training Programs and Operations & Maintenance.	233400	3.03.A							
214.	Air Terminal Units	Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories. 4. Seismic-restraint devices.	233600	1.03.A.4							
215.	Air Terminal Units	Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following: 1. Instructions for resetting minimum and maximum air volumes. 2. Instructions for adjusting software set points.	233600	1.03.F							
216.	Air Terminal Units	Engage a factory-authorized service representative to train SFMTA's maintenance personnel to adjust, operate, and maintain air terminal units.	233600	3.08.A							
217.	Custom Indoor Central Station Air Handling Units	The Unit Electrical Panel(s) shall be built in strict accordance to NEC Standards and shall bear an appropriate label certifying compliance with UL Standard 508A.	237323	1.04.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
218.	Custom Indoor Central Station Air-Handling Units	Include data on design, inspection and procedures related to preventative maintenance. Operation and Maintenance manuals shall be submitted at the time of unit shipment under provisions of Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	237323	1.06.A							
219.	Custom Indoor Central Station Air-Handling Units	Insulation: Panels to be insulated with 2- to 3-pound double density pre molded rigid board fire-resistant NFPA 90B and ASTM E 84 requirements for Flame Spread of 25 or less and Smoke Development of 50 or less. Insulation shall have a thermal conductivity K factor of .23 Btu/hr/Sq. ft/degree F @ 75 degrees F mean and provide the following sound attenuation characteristics (in accordance with ASTM C 423 - Type "A" Mounting): 1. Octave bands: 150, 250, 500, 1k, 2k, 4k, and 8k 2. Absorption Coefficient: 0.17, 0.80, 1.16, 1.15, 1.11, 1.10, and 1.05 (for 2-inch-3-pound) 3. All cut edges of the board insulation shall be completely enclosed by the unit panels. A finish bead of caulking will be applied over all foil to panel seams and inner liners to main panel seams to completely encapsulate the insulation.	237323	2.03.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
220.	Custom Indoor Central Station Air-Handling Units	Access Doors. Doors shall open against static pressure unless obstructed by internal components. If obstructed by internal components on the positive sections requiring access, the doors shall open with pressure and shall be provided with a safety restraining mechanism. Doors used to access rotating equipment shall be provided with an OSHA approved safety latching mechanism requiring a tool to open and shall also have a highly visible, permanently fixed, caution sign on the exterior of the door. Doors with access to moving parts must also have locking hardware and meet current UL mechanical protection guidelines. Standard door size shall be 24 inches wide by 60 inches high unless restricted by height or section width.	237323	2.03.D.3							
221.	Variable Refrigerant Flow Systems	Operation and Maintenance Data: Furnish installation, maintenance, and operating instruction manuals, complete with parts list.	237450	1.05.E							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
222.	Variable Refrigerant Flow Systems	The following safety devices shall be included on the condensing unit; high pressure switch, control circuit fuses, crankcase heaters, fusible plug, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor, over current protection for the inverter and antirecycling timers. To ensure the liquid refrigerant does not flash when supplying to the various fan coil units, the circuit shall be provided with a sub-cooling feature.	237450	2.02.B.11							
223.	Variable Refrigerant Flow Systems	Refrigerant Volume : The Basis of Design meets AHRAE 15 – Safety Standard for Refrigeration Systems for refrigerant volume limits in enclosed spaces. It will be the Contractor's responsibility to verify conformance with ASHRAE for any substituted VRF system and make any changes necessary to ensure compliance at no additional cost SFMTA. Compliance calculations and design impacts shall be presented in the equipment submittal.	237450	3.01.L							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
224.	Decentralized Unitary HVAC Equipment	Operation and Maintenance Data: Submit manufacturer's printed operation and maintenance instructions, in accordance with Section 01 79 00, Training Programs and Operations & Maintenance Manuals, describing operating procedures and maintenance sequences. Include manufacturer's recommended spare parts list for maintenance requirements.	238100	1.04.D							
225.	Decentralized Unitary HVAC Equipment	Provide smoke detectors for air conditioning equipment to automatically shutdown the system upon detecting the presence of smoke as required by NFPA 90A, and connect to equipment controls and fire alarm system and connect to equipment controls and existing fire alarm system.	238100	2.01.F							
226.	Dampers For Emergency Ventilation	Within 60 days after Notice to Proceed, submit the following: Test program plan and schedule.	238810	1.05.C.7							
227.	Dampers For Emergency Ventilation	Within 60 days after Notice to Proceed, submit the following: Factory and field test procedures, with dimensional drawings of damper test unit, diagrams of test setups, sample test forms, and pass-fail criteria for the tests.	238810	1.05.C.8							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
228.	Dampers For Emergency Ventilation	Within 21 days after successful completion of all factory tests specified herein and of any additional tests conducted at Contractor's own option, submit the following: 1. Certified results for all tests conducted. Actual performance curves verifying the theoretical performance curves previously submitted shall be furnished as part of the damper unit test results.	238810	1.05.D.1							
229.	Dampers For Emergency Ventilation	Operating and Maintenance Manuals. After approval of the preliminary submittal and having made all necessary corrections and amendments required, provide the SFMTA with 20 additional copies of the approved dated manuals.	238810	1.05.E.1							
230.	Dampers For Emergency Ventilation	Within 21 days after successful completion of tests specified herein and of any additional tests conducted at Contractor's own option, submit the following: 1. Certified test results for all damper factory and field tests conducted.	238810	1.05.F.1							
231.	Dampers For Emergency Ventilation	Thermal overload protective devices shall be capable of being overridden during emergency operations.	238810	2.01.B.6							
232.	Dampers For Emergency Ventilation	Upon loss of power, dampers shall move to the power-off position (open or closed) as indicated in the Tunnel Ventilation Motor Operated Damper Schedules on the Drawings.	238810	2.01.B.9							
233.	Dampers For Emergency Ventilation	The damper operator shall be equipped with a hand wheel for manual override.	238810	2.03.N							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
234.	Dampers For Emergency Ventilation	Field Test Program Submit to the Engineer for approval a written test program at least 45 days before the scheduled date of field test initiation.	238810	3.02.E.1							
235.	Dampers For Emergency Ventilation	All dampers shall be tested for proper sequence operation by operating the fans from the Fan Control Panel for all fan operation modes.	238810	3.02.E.9							
236.	Sound Attenuators For Emergency Ventilation	The combustion rating of the filler material, when tested in accordance with ASTM E84 shall be not greater than the following: 1. Flame Spread Classification: 20 2. Smoke-Developed Rating: 20	238820	2.02.E							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
237.	Fan-Motor Units for Emergency Ventilation	Within 21 days after successful completion of tests specified herein and of any additional tests conducted at Contractor's own option, submit the following: 1. Certified test results for all fan and motor factory tests conducted. All test procedures and data shall be bound in one report. The test report shall be indexed and cross-referenced in an easily understood manner. Update all curves reflecting factory test results. 2. All records and results of non-destructive examinations made at completion of each examination. 3. Field test results. 4. Radiographic inspection films. 5. Furnish drawing of each fan impeller indicating the fan blade number and weight of each fan blade and blade and hub x-ray numbers with the factory test report.	238830	1.04.D							
238.	Fan-Motor Units for Emergency Ventilation	Operation and Maintenance Manuals After approval of the preliminary submittal and having made all necessary corrections and amendments required, provide 20 additional copies of the approved dated manuals.	238830	1.04.E.1							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
239.	Fan-Motor Units for Emergency Ventilation	Fans and all components shall be capable of operating for not less than 1 hour in an ambient temperature of not less than 482 degrees Fahrenheit. Fans, motors, and components shall be capable of withstanding sudden temperature changes because of fire between the extremes of 0 and 482 degrees Fahrenheit or vice versa. Submit maximum design stress of rotating components at maximum fan speed and temperature of 482 degrees Fahrenheit and designate types of materials to be used in design by their ASTM designations or other approved equal.	238830	2.01.B.1							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
240.	Fan-Motor Units for Emergency Ventilation	Fan-motor units shall be capable of accelerating from a standstill to rated rotational speed, in either direction, in not more than 15 seconds and without failure of any part of the unit, when started across-the-line with rated voltage (4160 volts) at the motor terminals before starting and a voltage dip of not more than 15 percent of the rated voltage during starting. Fan-motor units shall be capable of reversing to full speed from either direction of airflow and rotation during an emergency within 15 seconds when started across the line with rated voltage (4160 volts) at the motor terminals before starting and a voltage dip of not more than 15 percent of the rated voltage during starting, after a 10-second delay between power interruption and the energizing of the motor for the reversed rotation, without failure of any part of the unit.	238830	2.01.C.4							
241.	Fan-Motor Units for Emergency Ventilation	Emergency ventilation fans shall be provided with a reverse airflow sensor. The flow sensor shall have the capability to detect flow in either direction.	238830	2.07.A							
242.	Fan-Motor Units for Emergency Ventilation	Submit to the Engineer for approval a written test program at least 45 days before the scheduled date of field test initiation.	238830	3.03.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
243.	Integrated Automation Local Control Units	Within ninety (90) days after Notice to Proceed, the Contractor shall submit seismic calculations to show compliance with the requirements of the Contract. Submittals shall be signed and sealed by a Registered Professional Structural Engineer Licensed in the State of California.	251400	1.05.E							
244.	Integrated Automation Local Control Units	Within sixty (60) days prior to the field testing, the Contractor shall submit a detailed testing plan for Field Testing (25 14 00 – 6). Field test plans and reports shall be in accordance with Section 26 08 15, Factory and Field Testing.	251400	1.05.G							
245.	Integrated Automation Local Control Units	Within thirty (30) days of successfully completing field testing, the Contractor shall submit a test report with the entire field testing results (25 14 00 – 9) including certified reports of electrical continuity, insulation, and ground continuity tests performed on installed products.	251400	1.05.I							
246.	Integrated Automation Local Control Units	The Contractor shall furnish an Operations and Maintenance Manual covering each piece of equipment.	251400	1.05.K.1							
247.	Integrated Automation Local Control Units	Prior to Substantial Completion the Contractor shall submit training materials in accordance with Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	251400	1.05.M							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
248.	Integrated Automation Local Control Units	Programmable Logic Controller (PLCs) shall be dual redundant PLC's as manufactured by Siemens, Allen Bradley or Modicon or approved equal 1. The switching to the standby CPU shall be configured and engineered by the PLC manufacturer. Changeover shall occur if the on-line PLC fails, or the communications to the on-line PLC fails, and shall not cause a loss of data or disturbance to the system	251400	2.02.A.1							
249.	Integrated Automation Local Control Units	Configure the PCR control logic to satisfy the following requirements: 1. When a fan start command is issued, either locally or remotely, the FCP shall issue an open command to the fan's damper modules. When the FCP detects that at least one damper module is not fully closed, the FCP shall issue a start command to the fan starter.	251400	3.01.B.1							
250.	Integrated Automation Local Control Units	Configure the PCR control logic to satisfy the following requirements: 2. Fan running status, either supply or exhaust, shall be based on satisfying three parameters: fan contactor closed, fan current exceeds a preset setpoint and the fan motion detector senses that the impellor speed exceeds a preset setpoint.	251400	3.01.B.2							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
251.	Integrated Automation Local Control Units	Configure the PCR control logic to satisfy the following requirements: 3. Fan stopped status shall be determined by verifying that both fan contactors are deenergized.	251400	3.01.B.3							
252.	Integrated Automation Local Control Units	Configure the PCR control logic to satisfy the following requirements: 4. If one or more damper modules do not provide a fully open or closed indication, a damper trouble alarm shall be generated.	251400	3.01.B.4							
253.	Integrated Automation Local Control Units	Configure the PCR control logic to satisfy the following requirements: 5. When in emergency mode, and a remote fan start command is received, the FCP shall transmit a contact closure to the fan starter to bypass the fan and damper motor overloads and vibration and temperature sensors protection devices and the damper modules fully closed indication.	251400	3.01.B.5							
254.	Integrated Automation Local Control Units	Configure the PCR control logic to satisfy the following requirements: 6. In the normal operation mode, if the fan locked rotor current occurs for 30 seconds as detected by the fan's multifunction protection relay (MPR), close the fan's damper and shutdown the fan.	251400	3.01.B.6							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
255.	Integrated Automation Local Control Units	Perform factory tests in accordance with the requirements specified in Section 26 08 00, Electrical Testing and Commissioning, and Section 26 08 15, Factory and Field Testing, including testing SCADA I/O Points as listed in the EV Drawings to ensure that future system integration tests can be conducted using the input/output points required for overall system control and operation.	251400	3.02.A							
256.	Integrated Automation Local Control Units	Perform functional tests of each FCP in local control mode including the starting and stopping of the fan and opening and closing the damper. Simulate abnormal conditions and verify that the information is correctly displayed on the FCP. Verify that the information is correctly displayed on the workstations in the Project Test Center (PTC). Testing shall be coordinated with the functional SCADA system requirements specified in Section 26 08 15, Factory and Field Testin,g including testing SCADA I/O Points as listed in the EV Drawings to ensure that future system integration tests can be conducted using the input/output points required for overall system control and operation and any Communication SCADA Systems requirements.	251400	3.04.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
257.	Integrated Automation Local Control Units	Perform functional tests of each FCP in remote control mode including the manual starting and stopping of the fan and opening and closing the damper from the PTC. Verify that fan and damper motor protection is bypassed in Emergency mode.	251400	3.04.D							
258.	Basic Electrical Requirements	Final coordination drawings, with as-constructed information added, are to be submitted as record drawings at completion of project.	260000	1.06.E							
259.	Medium Voltage Cables	Perform the following field quality-control testing: 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.2. Certify compliance with test parameters.	260513	3.02.A							
260.	Low-Voltage Electrical Power Conductors and Cables	Fire Resistant and Low-smoke: All conductors in this section shall comply with 5.4 and 6.3.3 of NFPA 130.	260519	2.01.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
261.	Low-Voltage Electrical Power Conductors and Cables	All wires and cables used shall be listed as being resistant to the spread of fire and shall have reduced smoke emissions, by complying with: 1. All wires and cables shall comply with the FT4/IEEE 1202 exposure requirements for cable char height, total smoke released, and peak smoke release rate of ANSI/UL1685 or: 2. Wires and cables listed as having adequate fire-resistant and low-smoke producing characteristics, by having a flame travel distance that does not exceed 5 feet (1.5 m) and generating a maximum peak optical density of smoke of 0.50 and a maximum average optical of smoke of 0.15 when tested in accordance with NFPA 262 shall be permitted for use instead of the wires and cables specified above.	260519	2.01.E							
262.	Low-Voltage Electrical Power Conductors and Cables	Conductors in conduits or raceways shall be permitted to be embedded in concrete or run in concrete or run in concrete electrical duct banks, but they shall not be installed exposed or surfaced-mounted in air plenums unless cables are listed fire-resistive cable having a minimum 1-hour fire-resistive rating in accordance with ANSI/UL 2196 and shall be installed per the listing requirements.	260519	3.03.K							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
263.	Low-Voltage Electrical Power Conductors and Cables	Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to firestopping material used.	260519	3.06.A							
264.	Low-Voltage Electrical Power Conductors and Cables	Test Reports: Prepare a written report to record the following: 1. Test procedures used. 2. Test results that comply with requirements. 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.	260519	3.07.C							
265.	Wire and Grounding	Check all low voltage cables and wires for continuity. Verify wire numbers and check for conformity between schematic wiring diagrams and actual wiring.	260520	3.07.C							
266.	Wire and Grounding	Perform insulation resistance tests of all low voltage cables and wires in accordance with NETA Section 7.3.2.2 requirements.	260520	3.07.D							
267.	Wire and Grounding	Test grounded equipment enclosures, raceways, conduits, exposed expansion joints, trench ducts, and trolley poles for continuity to the ground rod system.	260520	3.07.F							
268.	Wire and Grounding	Perform system grounding and equipment grounding inspection and testing in accordance with NETA Standards.	260520	3.07.G							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
269.	Grounding and Bonding for Electrical Systems	Perform the following tests and inspections and prepare test reports: 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements. 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.	260526	3.04.A							
270.	Grounding and Bonding for Electrical Systems	Report measured ground resistances that exceed the following values: 1. Power and Lighting Equipment or System with Capacity 500 kVA and less: 10 ohms. 2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms. 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms. 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s). 5. Substations and Pad-Mounted Equipment: 5 ohms.	260526	3.04.B							
271.	Raceway and Boxes for Electrical Systems	Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.	260533	3.04.A							
272.	Raceways (Traction Power)	Provide As-Built & Record Drawings in accordance with Section 01 78 39, Project Record Documents.	260534	3.03.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
273.	Junctions and Pullboxes	Fire/Police pull station pull boxes shall be type 3. All pull boxes covers shall be three-piece and inscribed with "PUBLIC SAFETY". Letters shall be 1 inch high and made with 1/4-inch wide strokes. Letters inscribed on concrete lids covers shall be made with 1/8-inch (minimum) deep imprints. Legends in steel covers shall be made with weld bead letters.	260535	2.01.G							
274.	Cable Trays for Electrical Systems	Field quality-control reports.	260536	1.02.B							
275.	Underground Ducts and Raceways for Station Power	Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."	260543	3.05.A.3							
276.	Seismic Controls for Electrical Work	Pre-approval and Evaluation Documentation: By an agency approved by authorities having jurisdiction, showing maximum ratings of restraints. Provide written report of tests and inspections.	260548	1.03.C							
277.	Overcurrent Protective Device Coordination Study	Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.	260573	1.02.B							
278.	Electrical Testing and Commissioning	Collaborate with the General Contractor to provide a complete commissioning and training plan submittal for the electrical work.	260800	1.03.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
279.	Electrical Testing and Commissioning	Perform commissioning work in accordance with Power Check Lists and equipment manufacturer's standard procedures and check lists, including but not limited to: 1. Verify test readings, such as: a. Cable DC Hipot. b. Ground fault protection. c. Ground resistance. d. Frequency. e. Transformer heating. f. Circuit breaker tripping. 2. Verify calibration of meters: a. Kwhr meters. b. Voltmeters. c. Ampmeters. d. Frequency meters. e. Circuit Breakers. 3. Verify operation of electronic power monitors.	260800	3.05.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
280.	Electrical Testing and Commissioning	Functional Performance Test: Demonstrate operation of power distribution system per specifications including the following: 1. Activate system by connection to utility power. 2. Demonstrate draw out operation of circuit breakers. 3. Verify voltages and amperes at meters on switchgear. 4. Verify voltages and amperes at switchboards, motor control centers, panelboards, and transformers primary and secondary. 5. Verify voltages and amperes at mechanical motors and other major pieces of equipment.	260800	3.06.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
281.	Electrical Testing and Commissioning	Perform [Fire Alarm System] commissioning work in accordance to the manufacturer's standard procedures and check lists, including but not limited to: 1. Verify tests such as: a. Alarm db. b. Detectors initiating signal. c. Trouble lights. 2. Verify settings of a. Smoke detectors. b. Heat detectors. c. Duct detectors. 3. Verify readings of remote data, such as annunciator panel. 4. Verify operation of system models, such as: a. Elevator control. b. Sprinkler supervisory alarm. c. Door hold open/ release. 5. Verify that total alarm system is performing to provide conditions as outlined in the design intent.	260800	3.07.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
282.	Electrical Testing and Commissioning	Functional Performance Test: Demonstrate operation of fire alarm system per specifications including the following: 1. Alarm initiating devices including pull stations, ceiling smoke detectors, duct smoke detectors, heat detectors, and sprinkler alarm switches. 2. Air handling unit redirect upon alarm. 3. Elevators upon alarm. 4. Verify tie-in and proper system operation with any off-site system monitoring. 5. Fire alarm system annunciator panel. 6. Alarm devices, visual and audible. 7. Central processing unit alphanumeric display and printer. 8. Verify system function upon loss of power.	260800	3.08.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
283.	Electrical Testing and Commissioning	Lighting System and Controls Testing Requirements. This is a performance test to verify lighting system operation, light levels, and energy usage. Sampling Strategy for Identical Units. a. Lighting Controls: Test all automatic interior lighting controls. b. Fluorescent Lamp Ballasts: Test each ballast in the rooms selected for the illumination level test. c. Electric Lighting photocell controls: Test all photo sensors. d. Illumination Levels: Rooms randomly selected by the Commissioning Authority shall be verified to achieve appropriate light levels. If 25% of the spaces in the first sample fail the functional performance tests, test another 10% of the group (the 2nd sample). If 10% of the spaces in the 2nd sample fail, test all remaining spaces, fully at the contractor's expense. e. Power Density: Test all lighting circuits to obtain overall building average.	260800	3.09.A.6							
284.	Electrical Testing and Commissioning	At job completion, allot a period of not less than 24 hours for instruction of building operating and maintenance personnel in the use of all systems. Include high voltage safety training. This instruction time (24 hours) is in addition to any instruction time called out in other Division 26, 27 and 28 Sections.	260800	3.11.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
285.	Lighting Control Devices	Operation and Maintenance data.	260923	1.02.C							
286.	Lighting Control Devices	Perform the following field tests and inspections and prepare test reports: 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements. 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.	260923	3.05.A							
287.	Network Lighting Controls	Operation and maintenance data.	260943	1.03.G							
288.	Primary Unit Substations	Source quality-control test reports.	261113	1.03.E							
289.	Primary Unit Substations	Field quality-control test reports.	261113	1.03.F							
290.	Primary Unit Substations	Operation and maintenance data.	261113	1.03.G							
291.	Secondary Unit Substations	Source quality-control test reports.	261116	1.03.E							
292.	Secondary Unit Substations	Field quality-control test reports.	261116	1.03.F							
293.	Secondary Unit Substations	Operation and maintenance data.	261116	1.03.G							
294.	Medium-Voltage Transformers	Include procedures for sampling and maintaining fluid, cleaning and maintaining unit, and replacing components.	261200	1.05.A							
295.	Medium-Voltage Transformers	Install safety labels to NEMA 260.	261200	3.02.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
296.	Medium-Voltage Transformers	Perform electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.2. Certify compliance with test parameters.	261200	3.06.A							
297.	Medium-Voltage Swtichgears	Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.	261300	1.08.A							
298.	Medium-Voltage Swtichgears	Mechanical Interlock: Prevent opening switch compartment door unless switchblades are open, and prevent closing switch if door is open.	261300	2.03.F							
299.	Medium-Voltage Swtichgears	8. Approval of Grounding and Testing Device System: Obtain approval of final system design from utility company and agency designated by Owner	261300	2.04.H.8							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
300.	Medium-Voltage Swtichgears	Auxiliary Devices 2. Voltage and control power transformers of the quantity and ratings indicated in the detail specification shall be supplied. Voltage transformers shall be mounted in drawout drawers contained in an enclosed auxiliary compartment. Control power transformers up to 15 kV, 15 kV, singlephase shall be mounted in drawout drawers. Rails shall be provided for each drawer to permit easy inspection testing and fuse replacement. Shutters shall isolate primary bus stabs when drawers are withdrawn.	261300	2.04.K.2							
301.	Medium-Voltage Swtichgears	Perform the following field tests and inspections and prepare test reports: 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for each of the following NETA categories: a. Switchgear. b. Circuit breakers. c. Protective relays. d. Instrument transformers. e. Metering and instrumentation. f. Ground-fault systems. g. Battery systems. h. Surge arresters. i. Capacitors.	261300	3.07.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
302.	48VDC Power Supply for Medium-Voltage Circuit Breaker Control	Furnish one each of the following: 8. Non-ventilated safety goggles. 9. Safety apron. 10. Safety gloves of approved brand. 11. "No Smoking" sign, to be installed on battery room door. 12. One eye wash station.	261400	2.04.E							
303.	48VDC Power Supply for Medium-Voltage Circuit Breaker Control	y. Provide “C” contacts for common alarms to be monitored by the fire alarm panel.	261400	2.05.A.2.y							
304.	48VDC Power Supply for Medium-Voltage Circuit Breaker Control	Grounding a. System Grounding 1) The charger AC input and DC output shall be electrically isolated from each other and from cabinet ground.	261400	2.05.A.6							
305.	48VDC Power Supply for Medium-Voltage Circuit Breaker Control	Remote Monitoring and Control a. Charger shall be capable of having all parameters including, but not limited to, alarm settings, charge voltage levels, history of events, being monitored by remote communication through a PC. b. Charger shall be capable of having all parameters being adjusted remotely. c. Charger shall have multi-level security controls to prevent unauthorized changes to any and all parameters.	261400	2.05.A.9							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
306.	48VDC Power Supply for Medium-Voltage Circuit Breaker Control	The Supplier shall provide inspection and test procedures for battery and chargers to the Buyer for review and approval in accordance with Suppliers Data Requirements. The charger performance test shall be conducted in accordance with the requirements of NEMA PE-5 or CSA/UL NRTL. The Supplier shall provide certified test results for the factory test.	261400	2.05.B.2							
307.	48VDC Power Supply for Medium-Voltage Circuit Breaker Control	Supplier shall provide Industry Standard with proper spill containment system to be included. System will not only fully 100 percent absorb the electrolyte but shall also neutralize the electrolyte totally.	261400	2.06.A							
308.	Low-Voltage Transformers	Field quality-control test reports.	262200	1.02.D							
309.	Low-Voltage Transformers	Operation and maintenance data.	262200	1.02.E							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
310.	Low-Voltage Switchgears	Manufacturer Seismic Qualification Certification: Submit certification that switchgear, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 26 05 48, Seismic Controls for Electrical Systems. Include the following: 1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event." 2. Dimensioned Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. 3. Detailed description of equipment anchorage devices on which the certification is based.	262300	1.02.C							
311.	Low-Voltage Switchgears	Ground-fault protection with at least three short-time-delay settings and three trip-time-delay bands; adjustable current pickup. Arrange to provide protection for the following: a. Three-wire circuit or system. b. Four-wire circuit or system. c. Four-wire, double-ended substation.	262300	2.05.D							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
312.	Low-Voltage Switchgears	Drawout Features: Circuit-breaker mounting assembly equipped with a racking mechanism to position circuit breaker and hold it rigidly in connected, test, and disconnected positions. Include the following features: 1. Interlocks: Prevent movement of circuit breaker to or from connected position when it is closed, and prevent closure of circuit breaker unless it is in connected, test, or disconnected position.	262300	2.05.F.1							
313.	Low-Voltage Switchgears	Padlocking Provisions: For installing at least three padlocks on each circuit breaker to secure its enclosure and prevent movement of drawout mechanism.	262300	2.05.H							
314.	Low-Voltage Switchgears	Key Interlocks: Arranged so keys are attached at devices indicated. Mountings and hardware are included where future installation of key-interlock devices is indicated.	262300	2.05.K							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
315.	Low-Voltage Switchgears	Perform the following field tests and inspections and prepare test reports: 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for each of the following NETA categories: a. Switchgear. b. Circuit breakers. c. Protective relays. d. Instrument transformers. e. Metering and instrumentation. f. Ground-fault systems. g. Surge arresters.	262300	3.03.C							
316.	Switchboards	Product Data: Submit manufacturer's product data for all manufactured materials and equipment. Submit certified reports of factory tests performed on each switchboard unit.	262413	1.04.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
317.	Switchboards	Operation and Maintenance Data: Submit data in accordance with Section 01 78 23, Operation and Maintenance Data, including the following requirements: 1. Description of the switchboard and its components; 2. Manufacturer's operating and maintenance instructions, parts list, illustrations, and diagram for components; 3. Recommended list of spare parts; 4. Wiring diagram; 5. Electrical characteristics of each component including relays or solid state circuitry; and 6. Relay coordination curves.	262413	1.04.D							
318.	Switchboards	Perform the following field tests and inspections and prepare test reports: 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for each of the following NETA categories: a. Switchgear. b. Circuit breakers. c. Protective relays. d. Instrument transformers. e. Metering and instrumentation. f. Ground-fault systems. g. Battery systems. h. Surge arresters. i. Capacitors.	262413	3.05.G							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
319.	Switchboards	Provide equipment for testing power, lighting, and control circuits after installation, including service test kit. Test under the observation of the Engineer, and demonstrate the following attributes: 1. Verify that circuits are connected in accordance with the applicable wiring diagrams. 2. Verify that circuits are continuous and free from short circuits. 3. Verify that the insulation resistance to ground of non grounded conductors is megger tested to not less than 10 MΩ. 4. Verify that the completed equipment grounding system is megger tested at each service disconnect enclosure ground bar to ensure connection to ground.	262413	3.07.A							
320.	Panelboards	Operation and maintenance data.	262416	1.03.F							
321.	Panelboards	Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.	262416	3.03.E							
322.	Medium Voltage (4.167kv) Motor Controllers	Submit seismic calculations to show compliance with the requirements of the Contract. Submittals shall be signed and sealed by a Registered Professional Structural Engineer licensed in the State of California.	262425	1.05.F							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
323.	Medium Voltage (4.167kv) Motor Controllers	Submit a test report with all factory testing results.	262425	1.05.I							
324.	Medium Voltage (4.167kv) Motor Controllers	Submit a test report with all field testing results.	262425	1.05.J							
325.	Medium Voltage (4.167kv) Motor Controllers	Submit Operations and Maintenance Manuals.	262425	1.05.L							
326.	Medium Voltage (4.167kv) Motor Controllers	The isolating switch shall isolate the power bus compartment from the power cell by means of a positively driven shutter mechanism to prevent accidental contact with line terminals in the power bus compartment.	262425	2.05.C.1 .b							
327.	Medium Voltage (4.167kv) Motor Controllers	In the open position, the isolating switch and contactor shall provide a means of grounding appropriate medium voltage power cell components, bleeding off hazardous store energy, thus providing safe operation and maintenance.	262425	2.05.C.1 .d							
328.	Medium Voltage (4.167kv) Motor Controllers	The external isolating switch operating handle shall have provisions to be padlocked, with up to three padlocks in the open position, and one padlock in the closed position. The closed position shall be located and marked, but shall be drilled out to allow insertion of the padlock. Padlocks will be provided by the Engineer.	262425	2.05.C.1 .g							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
329.	Medium Voltage (4.167kv) Motor Controllers	The power cell door on each controller shall be interlocked with the isolating switch such that any medium voltage door(s) cannot be opened when the isolating switch is fully closed, and the isolating switch cannot be closed when the door is open (without defeating the safety interlock).	262425	2.05.C.1 .h							
330.	Medium Voltage (4.167kv) Motor Controllers	Vacuum bottle and coil maintenance shall not require removal of the vacuum contactor to ensure solid, continuous contact while lowering maintenance requirements, the vacuum contactor shall be fixed mounted inside the power cell. The contactors shall be interlocked with no-load-break isolating switch, both electrically and mechanically, to provide the following safety features: 1) Prevent the isolating switch from being opened or closed when the contactor is in the closed position. 2) Prevent the opening of the medium voltage door when the isolating switch is in the closed position. 3) Prevent the closing of the isolating switch when the medium voltage door of the controller is open.	262425	2.05.C.4 .d							
331.	Medium Voltage (4.167kv) Motor Controllers	Provide Firewrapped tape as indicated to all conduits within the same room as the emergency fan motors.	262425	3.04.L							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
332.	Medium Voltage (4.167kv) Motor Controllers	Provide the Engineer copies of a written report on the installation and operational testing of the equipment in accordance with the manufacturer's written instructions. List inspections and tests conducted and all results, including problems found and how they were rectified. Certify that the equipment is ready for acceptance testing.	262425	3.06.C.2							
333.	Medium Voltage (4.167kv) Motor Controllers	Test Reports. 1. Submit to the Engineer a written record of inspections, test, and detailed test results in the form of a test log, on the satisfactory completion of tests. All equipment and other components at which tests have been satisfactorily completed shall be tagged to indicate completion of testing. Compile list of load-current and settings of adjustable overload relays after motors have been installed.	262425	3.06.F							
334.	Medium Voltage (4.167kv) Motor Controllers	Provide equipment demonstration and training for the SFMTA's maintenance personnel to adjust, operate, and maintain motor controllers, interlocking and controls, protective devices, instrumentation, and accessories.	262425	3.09.B							
335.	Enclosed Switches and Circuit Breakers	Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results.	262816	3.03.E							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
336.	Enclosed Controllers	Field quality-control reports.	262913	1.04.D							
337.	Enclosed Controllers	Operation and maintenance data.	262913	1.04.E							
338.	Static Uninterruptible Power Supply	Factory Test Reports: Comply with specified requirements.	263353	1.02.C							
339.	Static Uninterruptible Power Supply	Field quality-control reports.	263353	1.02.D							
340.	Static Uninterruptible Power Supply	Tests and Inspections: 1. Comply with manufacturer's written instructions. 2. Inspect interiors of enclosures, including the following: a. Integrity of mechanical and electrical connections. b. Component type and labeling verification. c. Ratings of installed components. 3. Inspect batteries and chargers according to requirements in IEEE standard. 4. Test manual and automatic operational features and system protective and alarm functions. 5. Test communication of status and alarms to remote monitoring equipment.	263353	3.02.B							
341.	Static Uninterruptible Power Supply	Provide a factory-authorized service representative to train SFMTA operation and 's maintenance personnel to adjust, operate, and maintain the UPS.	263353	3.03.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
342.	Lighting	Product Data Luminaire Manual: Submit light fixture manual which provides product data indicating fixture construction, photometric performance, installation, and maintenance requirements.	265000	1.03.B							
343.	Lighting	Test Reports: Submit certified test reports of factory and field tests performed, in accordance with applicable referenced standards and Specification requirements.	265000	1.03.C							
344.	Communications Racks And Frames	Delegated-Design Submittal: for supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the registered Structural professional engineer responsible for their preparation. Refer to section 27 51 16 for seismic criteria.	271116	1.02.B							
345.	Telephone System	Contractor shall provide opening for recessed [emergency] telephone cabinets and enclosure sleeves which the front panel dimension shall be 11.75 inches high by 8.5 inches wide overall depth shall not be greater than 2.7 inches.	273005	2.01.A.1							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
346.	Telephone System	The Braille plate shall be stainless steel with vandal resistant overlay and incorporate raised lettering and grade 2 Braille to aid sight impaired persons in identification. It shall be positively secured to the front panel (adhesives alone not acceptable). Raised Braille text lettering shall be at least 5/8 inch high and shall read "EMERGENCY PHONE" Braille and text lettering shall be of contrasting color to their background according to ADA specifications.	273005	2.01.A.1							
347.	Telephone System	The telephone cabinet shall be shall be 10.2"W x 12.5"H x 6.2"D, 16 gauge stainless steel, powder-coated red and UL listed.	273005	2.01.C.4							
348.	Telephone System	Telephone Systems shall be grounded to ground rod according to NEC.	273005	3.01,G							
349.	Public Address System	Training shall be in accordance with Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	275116	1.03.A							
350.	Public Address System	The Testing and Commissioning Program Plan, schedule, procedures, data sheets and results shall be prepared in accordance with Contract Specifications Section 26 08 00, Electrical Testing and Commissioning.	275116	1.07.C.6							
351.	Public Address System	O&M manuals in accordance with the requirements of Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	275116	1.07.C.7							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
352.	Public Address System	A training program plan for training SFMTA personnel, as described in Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	275116	1.07.C.8							
353.	Public Address System	Test measurements to verify conformance of the PA system design as indicated in ANSI S3.5-1997 (R2007) for intelligibility of speech and voice announcement requirements.	275116	1.07.C.10							
354.	Public Address System	The PA system shall broadcast voice messages to pre-defined zones for the Central Subway stations. Provide a minimum of two zones per station platform level and one zone for the mezzanine level or as indicated whichever is greater. Do not combine platform speakers and mezzanine speakers into the same zone. The ambient noise sensing microphones for mezzanine and platform levels shall be separate for independent zone control. The zones for broadcast shall be selectable individually or in any combination including all zones. The PA amplifier channel configuration shall support the required number of zones with spare amplifier channels for redundancy.	275116	2.01.B							
355.	Public Address System	The PA system shall be connected (NIC - by Contract No. 1256 and SFMTA IT) to existing SFMTA Systems Network and be remotely controlled and monitored at authorized SFMTA locations.	275116	2.01.I							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
356.	Public Address System	The PA system shall be integrated with the PDS (by Contract No. 1256) to provide the coordinated message delivery to the passenger stations both audibly and visually in compliance with ADA requirements.	275116	2.01.J							
357.	Public Address System	The PA system shall be powered by 120 VAC Uninterruptible Power System (UPS).	275116	2.01.P							
358.	Public Address System	The PA system shall meet the applicable provisions of the Americans with Disabilities Act (ADA).	275116	2.01.Q							
359.	Public Address System	Functional Requirements The PA system shall be capable of being used by the San Francisco Fire Department (SFFD) for emergency voice announcements. Microphones shall be provided at Command Post and Command Room that will have the highest priority. Any messages from PA system shall be muted at any time SFFD is using the microphones at the Command Post or Room.	275116	2.03.G							
360.	Public Address System	Functional Requirements The PA system speakers shall be powered by amplifiers in a redundant manner to prevent a single point of failure for amplifiers in an individual zone. The PA system shall provide for automatic switch-over to back-up amplifiers through an amplifier failover switch in the event of primary amplifier failure.	275116	2.03.H							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
361.	Public Address System	Performance Requirements PA system shall achieve an average sound pressure level (SPL) of 20 dB over ambient up to 105 dBA directly below each speaker and at five feet above floor level, in accordance with ANSI S1.8 and S1.13.	275116	2.03.A							
362.	Public Address System	All cabling provided shall be UL-Listed and have low-smoke zero halogen and fire resistive rating.	275116	2.08.B							
363.	Public Address System	Functional and Performance Tests: 1. Perform operational system tests to verify conformance of system to all inputs and outputs. 2. PA Coverage and Speech Intelligibility Tests: Test coverage and intelligibility of voice announcements within the passenger station premises. Verify the system meets requirements of these Specifications. Tests shall include announcements made from Central Control. The methods used for the measurement of sound pressure levels and intelligibility of speech shall conform to the requirements of ANSI S1.13 and S3.2. 3. Verify the back-up amplifiers/channels are switched automatically in the case of a failed amplifier/channel.	275116	3.04.C							
364.	Public Address System	Simulate signal from TMC/OCC to demonstrate that the Station PA System can be integrated by the PAV Central Controller. Record and document test procedure and certified the test results.	275116	3.05.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
365.	Public Address System	Contractor shall provide to SFMTA the application source code that has been specifically produced for the SFMTA to meet the functional requirements of the contract.	275116	3.08.A							
366.	Conductors and Cables for Electronic Safety And Security	Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.	280413	3.04.B.2							
367.	Conductors and Cables for Electronic Safety And Security	Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is not permitted.	280413	3.04.C.2							
368.	Access Control Systems	Complete engineered shop drawings submitted for approval prior to installation noting the following: d. SFMTA acceptance form with a check box associated with each card reader and input point to indicate that each point was checked off as properly installed and reporting back to the Reader Controllers and the host computer prior to SFMTA final acceptance of the system.	281300	1.06.A.5.d							
369.	Access Control Systems	Complete engineered shop drawings submitted for approval prior to installation noting the following: e. Eight (8) sets of the Manufacturer's Users' Manuals and Installation Manuals.	281300	1.06.A.5.e							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
370.	Access Control Systems	In addition to signal to SFMTA Security at One South Van Ness, the security system shall also be programmed to send simultaneous signals to Transportation Management Center (TMC) and Operations Control Center (OCC) for all Mechanical, Electrical and Communication Equipment Rooms and door hatches for unauthorized entry.	281300	1.07.C							
371.	Access Control Systems	Provide control relays and dry contacts for card readers that are egress as indicated to interface with Fire Alarm Conrol Panel (FACP) that will permit designated card reader doors to automatically open when upon signal from FACP	281300	2.02.H							
372.	Access Control Systems	Provide control circuits to unlocked designed doors that will allow Command Post Room to unlocked doors under emergency.	281300	2.02.I							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
373.	Access Control Systems	The open and close status of the doors and/or gates shall be monitored at SFMTA Headquarters located at One Van Ness and displayed at an existing security console. In addition from the console the doors may be programmed to stay in the unlocked or locked position at a given time period for a 7 day, 24 hour cycle. If a forced entry at a secured door or gate occurs without a valid card reader or permitted entry an alarm condition shall occur which will be displayed at the console at SFMTA Headquarters located at One South Van Ness and will sound an alarm horn in the Communication Station Agent booth and Equipment Room.	281300	3.01.F							
374.	Access Control Systems	Contractor shall verify each component in the access control system functions as intended per manufacturer descriptions.	281300	3.03.B							
375.	Access Control Systems	Contractor shall provide training program for all devices installed at Central Subway Stations.	281300	3.04.B							
376.	Security System (Traction Power)	The Contractor shall submit the following in accordance with Section 01 33 00, Submittal Procedures: 2. Sequence of operation, electrical schematics and connection diagrams to completely describe the operation of the security system, and controls.	281310	1.06.A.2							
377.	Security System (Traction Power)	All wiring shall be tested for proper connection, continuity, and resistance to ground.	281310	3.01.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
378.	Security System (Traction Power)	The complete system shall be functionally tested in the presence of the Engineer and all functions, including system and equipment interlocks must be operational at least ten (10) days prior to the final acceptance test. 1. Each detector shall be tested in accordance with the manufacturer's recommended procedure. The system and equipment interlocks such as audible alarms shall function at that time. 2. Each circuit shall be tested for trouble by inducing a trouble condition to the system.	281310	3.01.C							
379.	Security System (Traction Power)	Prior to training and acceptance tests, the Contractor shall provide complete operation and maintenance instruction manuals (eight copies for each system) to the Engineer, which shall conform to the guidelines set forth by Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	281310	3.02.A		Leave in.					
380.	Security System (Traction Power)	Prior to final acceptance, the Contractor shall provide operation training to City's personnel. Training session shall include emergency procedures, abort functions, system control panel operation, trouble procedures, and safety requirements.	281310	3.04.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
381.	Security System (Traction Power)	Tests shall demonstrate that the entire control system functions as intended. All circuits shall be tested; automatic discharge, manual discharge, equipment shutdown, alarm devices and storage container pressure. In addition, supervision of each circuit shall be tested.	281310	3.05.B							
382.	Intrusion Systems	Controller shall be housed in sheet metal cabinet constructed of 18 Ga., cold-rolled steel. Cabinet shall be provided with keyed lock.	281600	2.02.E							
383.	Intrusion Systems	Conduct full operational test with the SFMTA monitoring service. Test the system and all system component terminations and cabling and wiring for consistent operation. Troubles/ problems/conflicts shall to be addressed and repaired to the monitoring Contractor's satisfaction prior to acceptance of the Access Control System. Prior to the acceptance tests, an acceptance test plan shall be provided to the Engineer for their approval.	281600	3.06.A							
384.	Intrusion Systems	Within the first 30 days from system start-up the equipment supplier shall provide not less than 6 hours (two 3-hour sessions) for instruction of personnel in the operation and maintenance of the systems.	281600	3.09.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
385.	Intrusion Systems	Provide all instruments for testing and demonstrate in the presence of the SFMTA representative that all circuit and wiring tests are free of shorts and grounds and that the installation performs according to these Specifications and manufacturers' specifications.	281600	3.05.F							
386.	CCTV System	Power to CCTV system equipment shall be on facility UPS power.	282005	1.01.E							
387.	CCTV System	A 4-day classroom training on the CCTV system shall be given by Contractor's personnel in accordance with Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	282005	1.05.A							
388.	CCTV System	The Contractor shall submit the following to the Engineer for approval: 6. O&M manuals in accordance with the requirements of Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	282005	1.06.A.6							
389.	CCTV System	The Contractor shall submit the following to the Engineer for approval: 7. A single test checklist listing each component, subsystem and complete system to be tested, followed by the date the testing is to take place. This list shall have check-off and sign-off spaces next to each item for both Contractor and the Engineer.	282005	1.06.A.7							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
390.	CCTV System	The Contractor shall submit the following to the Engineer for approval: 9. A training program plan for training Muni personnel, as described in Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	282005	1.06.A.9							
391.	CCTV System	The Contractor shall submit the following to the Engineer for approval: 10. Shop Drawings d. Show the placement of all cameras on floor plan drawings, including the routing of conduit, the number of conductors in each conduit, mounting type and mounting heights. e. Show the intended coverage area for each camera, and the associate lens settings.	282005	1.06.A.10							
392.	CCTV System	The Contractor shall submit the following to the Engineer for approval: 11. Test Results: Record and submit the readings for the various specified tests. Test results shall be a comprehensive profile of the cable indicating it's compliance with the CAT6 standards.	282005	1.06.A.11							
393.	CCTV System	The system shall: 8. Provide individual loss of video alarm as the monitoring video workstation	282005	1.07.B.8							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
394.	CCTV System	Fixed and Pan-Tilt-Zoom cameras shall be installed at various locations throughout the station to ensure adequate coverage of the following regions such as but not limited to: 1. The inbound and outbound sides of the platforms and the track areas adjacent thereto. 2. All equipment cabinets including Ticket Vending Machines (TVMs). 3. Elevator and escalator locations. 4. Emergency stairways. 5. Paid and non-paid public areas. 6. Platform ramp areas.	282005	1.07.C							
395.	CCTV System	Video shall be recorded locally on network storage managers (NSM). When an alarm is detected from the Alarm Interface Unit (ALM), the video from the camera associated with the alarm shall be tagged as alarm video. The dwell time during alarm condition shall be programmable to a desired duration.	282005	1.07.D							
396.	CCTV System	All cameras at the station shall have camera sabotage behavior video analytics which detects camera vandalism and reports the alarm condition. The video management solution shall be able to accept these and other video analytic alarms from the IP cameras and manage them accordingly.	282005	1.07.F							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
397.	CCTV System	The alarm conditions which shall result in camera call up are the following: 1. Camera vandalism. (Identify the individual camera, maximum of fifteen cameras per platform.) 2. Platform equipment cabinet intrusion. 3. TVM door intrusion.	282005	1.07.H							
398.	CCTV System	A. Indoor/Outdoor Fixed Dome IP Camera 1. General h. Camera shall have tamper resistant hardware and have an impact resistance rating of IK10++ per EN62262 (5OJ).		2.01.A.1.h							
399.	CCTV System	C. Fixed Indoor/Outdoor Megapixel Dome IP Camera 1. General h. Camera shall have tamper resistant hardware and have an impact resistance rating of IK10++ per EN62262 (5OJ).		2.01.C.1.h							
400.	CCTV System	D. Indoor/Outdoor Fixed Dome Video Analytic IP Camera 1. General j. Camera shall have tamper resistant hardware and have an impact resistance rating of IK10++ per EN62262 (5OJ).		2.01.D.1.j							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
401.	CCTV System	A. Network Video Recorder Systems 1. General Requirements b. All systems shall be capable of access and control from central control workstations located at remote locations. 1) In the future a shared fiber backbone will be provided with dedicated fibers for connection of the CCTV systems to the central control workstations. All accessories and hardware shall be provided at each station to allow future migration to this new network.	282005	2.04.A.1 b.1)							
402.	CCTV System	NETWORK STORAGE MANAGER A. Rack mount NSM(s) in equipment cabinet in the main communication room.	282005	3.02.A							
403.	CCTV System	NETWORK STORAGE MANAGER C. Power from UPS backed source.	282005	3.02.C							
404.	CCTV System	Tests shall be conducted to determine if the systems, as supplied and installed, meet the following requirements where applicable. a. Images shall be free of ghosts or artifacts. b. Color shall be uniform. c. Images shall be sharp and focused d. Coverage and viewing areas shall be approved by the Agency.	282005	3.04.A.2							
405.	CCTV System	A complete operational test for all the equipment shall be performed by the Contractor once the CCTV system is completely installed.	282005	3.05.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
406.	CCTV System	Contractor shall coordinate with the Engineer to perform remote testing of the CCTV system at OCC. Contractor shall schedule remote testing 6 weeks prior to testing with the Engineer.	282005	3.05.G							
407.	Digital, Addressable Fire Alarm System	San Francisco Fire Department (SFFD): Separate Shop Drawings of the fire alarm and detection system shall be submitted to the SFFD for approval. Approval shall be obtained before beginning installation work. The Contractor shall submit a copy of the Contractor's transmittal to the SFFD for the Engineer's records and information.	283111	1.04.A.1							
408.	Digital, Addressable Fire Alarm System	Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in 01 79 00, Training Programs and Operations & Maintenance Manuals, include the following: <items 1 – 7>	283111	1.04.H.1							
409.	Digital, Addressable Fire Alarm System	Software and Firmware Operational Documentation: <items 1 – 4>	283111	1.04.I.1							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
410.	Digital, Addressable Fire Alarm System	Fire-alarm signal initiation shall be by one or more of the following devices: 1. Manual stations. 2. Heat detectors. 3. Smoke detectors. 4. Duct smoke detectors. 5. Automatic sprinkler system water flow. 6. Heat detectors in elevator shaft and pit. 7. Fire-extinguishing system operation. 8. Fire standpipe system. 9. Fire Suppression System.	283111	2.02.A							
411.	Digital, Addressable Fire Alarm System	Fire-alarm signal shall initiate the following actions: <items 1 – 10>	283111	2.02.B							
412.	Digital, Addressable Fire Alarm System	Supervisory signal initiation shall be by one or more of the following devices and actions: 1. Valve supervisory switch. 2. Low-air-pressure switch of a dry-pipe sprinkler system. 3. Elevator shunt-trip supervision.	283111	2.02.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
413.	Digital, Addressable Fire Alarm System	System trouble signal initiation shall be by one or more of the following devices and actions: 1. Open circuits, shorts, and grounds in designated circuits. 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices. 3. Loss of primary power at fire-alarm control unit. 4. Ground or a single break in fire-alarm control unit internal circuits. 5. Abnormal ac voltage at fire-alarm control unit. 6. Break in standby battery circuitry. 7. Failure of battery charging. 8. Abnormal position of any switch at fire-alarm control unit or annunciator. 9. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system. 10. Fire Suppression System is activated.	283111	2.02.D							
414.	Digital, Addressable Fire Alarm System	System Alarm, Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.	283111	2.02.E							
415.	Digital, Addressable Fire Alarm System	Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire alarm control unit.	283111	3.04.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
416.	Digital, Addressable Fire Alarm System	Field tests shall be witnessed authorities having jurisdiction.	283111	3.05.A							
417.	Digital, Addressable Fire Alarm System	Tests and Inspections: <items 1 – 6>	283111	3.05.B							
418.	Digital, Addressable Fire Alarm System	Prepare test and inspection reports.	283111	3.05.E							
419.	Digital, Addressable Fire Alarm System	Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.	283111	3.05.F							
420.	SEM Tunnel Instrumentation and Monitoring	The Contractor shall submit monitoring data to SFMTA in the form of files stored on compact disks (CD's), other digital storage devices or on the projects information handling system with a corresponding hard copy (print out) of the data. The data format shall be approved by SFMTA and shall be compatible with SFMTA's data analysis software. Each set of data shall clearly indicate the instrument identification number and location, reference elevation and depth for readings as appropriate, directions of movement as appropriate, the date and time that the readings were taken, and names of individuals who performed the measurement.	310913.60	1.05.B.1							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
421.	SEM Tunnel Instrumentation and Monitoring	Certification: Manufacturer's certification that products, materials, and equipment furnished meet the specified requirements. Submit information minimum 30 days prior to installation of instruments or commencement of any shaft and tunnel excavation, whatever occurs first.	310913.60	1.08.F							
422.	Tactile Warning Surfaces	Samples for Verification Purposes: Submit two tile samples minimum 6 inches by 8 inches of the kind proposed for use. Samples shall be properly labeled and shall contain the following information: Name of Project; Submitted by; Date of Submittal; Manufacture's Name; Catalog No., and Date of Fabrication.	321400	1.03.B							
423.	Tactile Warning Surfaces	Shop drawings: Submit shop drawings showing plans of tile placement including joints, all materials to be used, and an outline of installation procedures.	321400	1.03.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
424.	Tactile Warning Surfaces	Material Test Reports: Submit current test reports from a qualified independent testing laboratory indicating that materials proposed for use are in compliance with requirements and meet the properties indicated. Tests listed in Article 1.04 herein shall be performed by a certified and qualified independent testing laboratory on a cast-in-place tactile system. All test reports submitted shall be certified by the testing laboratory and shall be no more than 6 months old from the time of the submittal.	321400	1.03.D							
425.	Tactile Warning Surfaces	Color: Yellow conforming to Federal Standard 595B Table IV, Color No. 33538. Color shall be homogeneous throughout the tile.	321400	2.01.B							
426.	Tactile Warning Surfacing	The field area shall consist of a non-slip surface with a minimum static coefficient of friction of 0.80, wet and dry.	321726	2.01.D							
427.	Traction Power Substation Equipment	Prior to the fabrication of the equipment, certified copies of seismic calculations shall be submitted to the Engineer for review for the equipment to show compliance with the above requirements. The seismic calculations shall be signed and sealed by a California licensed Civil Engineer, submitted by the Contractor as part of a building permit application.	342116.16	1.05.B							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
428.	Traction Power Substation Equipment	Submittals and Shop Drawings: Submit data and drawings covering the following: [items 1 – 16]	342116.16	1.06.B							
429.	Traction Power Substation Equipment	Operations & Maintenance Manuals: The Contractor shall submit for approval eight copies of a proposed O&M manual for the substation. The manuals shall conform to the guidelines set forth by Section 01 79 00, Training Programs and Operations & Maintenance Manuals.	342116.16	1.06.G							
430.	Traction Power Substation Equipment	Control Panels: Each switchgear unit shall have hinged panels of formed steel for various relays, meters, and control equipment. All panels shall have rolled edges and be provided with conveniently located handles for opening. All live terminals on door mounted device shall be guarded, by the use of insulating boots or otherwise, to prevent inadvertent contact by maintenance personnel.	342116.16	2.01.A.6							
431.	Traction Power Substation Equipment	Provisions for Safety Grounding: The power buses shall be equipped with tabs compatible with a Bodendieck ground clamp.	342116.16	2.01.A.8							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
432.	Traction Power Substation Equipment	Power Circuit Breaker: 1. Description: The circuit breaker shall be Toshiba Catalog No. HVK-10M40A-VV or pre-approved equivalent complete with 125 Volt DC closing and trip coils, 125 Volt DC spring charging motor, 4 normally open and normally close auxiliary contacts, auxiliary relays, status and position indicators, mechanical operation counter which registers when the circuit breaker trips, necessary auxiliary switches, green light to indicate when the circuit breaker is tripped and auxiliary relay contactors. The red indicting light, which indicates that the breaker is closed, shall supervise the trip coil. Breaker position shall also be indicated by colored and marked mechanical flags, visible from the front of the switchgear (red = CLOSED, green = OPEN). Indicating lights shall be mounted on the front panel adjacent to the control switch. Indicating lights shall be as specified in Paragraph 2.01.L.	342116.16	2.01.B.1							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
433.	Traction Power Substation Equipment	Power Circuit Breaker: Grounding: When the breaker is in the "connected" or "test" positions, the case and frame shall be grounded by means of a positive contact with a copper ground bus. The breaker ground shoe shall connect the breaker frame to the ground bus prior to engagement of the primary breaker terminals.	342116.16	2.01.B.6							
434.	Traction Power Substation Equipment	Power Circuit Breaker: Interlocks: A suitable interlock shall automatically discharge the stored energy mechanism of the circuit breaker prior to withdrawal of the circuit breaker from its unit. Necessary additional auxiliary devices shall be provided to protect against inadvertent closing of the circuit breaker. Positive mechanical and electrical interlocks shall be provided to prevent racking in and out unless the circuit breaker is in the "Open" position. Interlocks shall be provided to prevent either electrical or manual operation of the breaker, unless it is in the "Operating" or "Test" position. The release of the stored energy mechanism shall be prevented if the closing springs are not fully charged.	342116.16	2.01.B.7							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
435.	Traction Power Substation Equipment	Primary Connections: The primary connections between the removable unit and the stationary unit shall be made by male and female contacts. These contacts shall be of the high-pressure, silver-plated type. Automatic shutters shall cover the orifices containing stationary contacts, when the breaker is withdrawn, and uncover the orifices when the breaker is returned to the connected position. The automatic shutters should be of suitable construction to withstand the force of the racking mechanism in case of failure of the shutters to open when the breaker is racked into position.	342116.16	2.01.B.8							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
436.	Traction Power Substation Equipment	C. Switchgear Bus and Connections: Ground Bus: A copper ground bus having a momentary rating not less than the highest momentary rating of the circuit breaker in the assembly, shall extend the full length of the switchgear assembly. All joints shall be silverplated and made with at least two bolts. Each housing shall be grounded directly to this bus. The frame of the circuit breaker shall be grounded through a ground contact shoe at all times, except when the primary disconnecting devices are separated and the shutters closed. At all points of connection between the ground bus and the structure, all non-conductive coatings shall be removed. Provision shall be made in each compartment for connecting cable shields, ground conductors and safety grounding clamps to the ground bus. The ends of each bus shall be provided with clamp type terminals for 500 MCM bare stranded conductors.	342116.16	2.01.C.6							
437.	Traction Power Substation Equipment	D. Power Cable Termination: 2. The high voltage terminations shall be enclosed to prevent accidental contact by unauthorized personnel.	342116.16	2.01.D.2							
438.	Traction Power Substation Equipment	Instrument Transformers: Grounding: Each current transformer secondary and frame shall be individually grounded by a short section of copper wire, minimum size No. 6 AWG, to the switchgear ground bus.	342116.16	2.01.E.3							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
439.	Traction Power Substation Equipment	Contacts shall be silver-plated and shall be designed to ensure adequate contact pressure. c. A connection shall be extended from the ground bus to the potential transformer compartment for grounding the cases of these transformers.	342116.16	2.01.F.c							
440.	Traction Power Substation Equipment	Protective Relays: Protective relays shall be SEL as described herein and/or on the contract drawings.	342116.16	2.01.G							
441.	Traction Power Substation Equipment	4. Device No. 86: Unit Lockout Relay shall be Electroswitch WL, General Electric HEA 62B or approved equivalent. Relays shall have 125 volts DC coils and shall be hand reset type. The hand reset switch shall be equipped with black oval handle. The relay coil shall be shunted by a suitable diode and resistor in series or a metal oxide Varistor, G.E. Model No. V130LA20B or approved equivalent.	342116.16	2.01.G.4							
442.	Traction Power Substation Equipment	C. Silicon Rectifier: c. Device 64: A terminal for connection to a DC structure ground relay. (See Article 2.03H(5) of this Section.) The terminal shall be permanently connected internally to the rectifier structure.	342116.16	2.02.C.6.c							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
443.	Traction Power Substation Equipment	C. Silicon Rectifier: d. Door Interlock: Each door of the rectifier enclosure shall be furnished with two (2) NO contacts which will close to initiate tripping of the unit lockout relay when the door is open. The contacts shall be convertible to normally closed.	342116.16	2.02.C.6.d							
444.	Traction Power Substation Equipment	C. Silicon Rectifier: e. Ground Cable Shunt: A 1000 ampere, 50 millivolt shunt shall be provided on the negative bus, with copper lugs, for two (2) 500 kcmil cables by Contractor. The shunt shall be connected to door-mounted insulated jacks, Flexlab HVR-5-25-09 (red) and HVR-5-011 (black), for use with City's recording ammeters. Connections to the shunt shall be made with 1000-volt No. 12 AWG wire, ten (10) feet long.	342116.16	2.02.C.6.e							
445.	Traction Power Substation Equipment	Rectifier enclosure shall be a high-resistance-grounded, ventilated structure. The enclosure shall be mounted on rigid self-supporting structural steel framework and shall have all principal members of its structure bonded together. The enclosure shall have protected openings to provide adequate ventilation for the components. Hinged doors shall be provided at front and rear.	342116.16	2.02.C.7							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
446.	Traction Power Substation Equipment	e. Enclosure Insulation: The rectifier enclosure will be insulated from ground by the use of ¼ inch epoxy floor insulation. A 2500 volt, 60 Hz, high-potential insulation test will be given by Contractor (in the presence of the Engineer) to the insulation between rectifier enclosure and ground upon completion of installation.	342116.16	2.02.C.7.e							
447.	Traction Power Substation Equipment	A negative disconnect switch shall be included with the rectifier units. The switch shall be single pole, bolted-pressure, hook-stick operated, busconnected to the negative rectifier terminals, and shall be installed in a separate metal-enclosed space. The switch may be made accessible by opening either a front or rear door, and shall be key-interlocked with the DC main circuit breaker to prevent operation unless the DC main circuit breaker is open and in the disconnected position. A hook stick shall be furnished with the rectifier. Switch rating shall be not less than 10,000 amperes. The switch shall be Powerswitch, Inc. or pre-approved equivalent.	342116.16	2.02.C.8							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
448.	Traction Power Substation Equipment	DC Switchgear: Personnel Protection: A shutter shall be provided in each breaker compartment which shall automatically operate to completely cover the stationary portion of the primary disconnecting device when the circuit breaker is withdrawn, or the disconnecting devices shall be designed so that they shall be protected from personnel or foreign material accidentally contacting or getting within unsafe clearances of any current carrying portion of the stationary disconnecting device member.	342116.16	2.03.D.4.b							
449.	Traction Power Substation Equipment	Compartment Doors: The front door shall be electrically interlocked to trip the breaker when the door is opened. A mechanical interlock to prevent opening the front door unless the breaker is tripped shall be provided.	342116.16	2.03.D.4.c							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
450.	Traction Power Substation Equipment	Circuit Breakers Position: In the “test” position, the primary disconnecting devices shall be disconnected with shutters fully closed and the secondary disconnecting devices shall be in full contact. In the “disconnected” position, both the primary and secondary disconnecting devices shall be opened and separated by a safe distance. Mechanical interlocks shall be provided to prevent moving a closed circuit breaker in or out of the “connected” position. An indicator shall be provided to show the location of the circuit breaker in “connected,” “test” or “disconnected” positions. Means shall be provided to permit padlocking the DC breaker to not allow the movement of the breaker from the “ test “ or “ disconnected “ position to the “ connected “ position or vice versa.	342116.16	2.03.D.4.e							
451.	Traction Power Substation Equipment	Interlock: The DC main circuit breaker shall be key interlocked with the negative disconnect switch in the rectifier enclosure to prevent operation of the switch unless the DC main circuit breaker is open.	342116.16	2.03.E.6							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
452.	Traction Power Substation Equipment	The main DC circuit breaker closing mechanism shall be furnished with a Kirk key interlock coordinated with the associated rectifier negative disconnect switch. The interlock system shall prevent closing of the circuit breaker unless the disconnect switch is closed and shall prevent the opening of the disconnect switch unless the circuit breaker is open and in the test or disconnected position.	342116.16	2.03.E.8.d							
453.	Traction Power Substation Equipment	Control Switch: A control switch and breaker position indicating lights shall be provided on each breaker unit.	342116.16	2.03.E.9.c							
454.	Traction Power Substation Equipment	Protective Devices and Metering: Meter, instrument and relay circuits shall be furnished, wired and connected in accordance with the drawings. Additional components such as auxiliary relays, isolating diodes and similar devices not shown in the Drawings, but required for a complete installation, shall be provided. Proposed settings of protective relays/devices shall be submitted to the Engineer for approval.	342116.16	2.03.H							
455.	Traction Power Substation Equipment	Protective Devices and Metering: Electronic high speed Overcurrent Trip (Device No. 76): Each feeder circuit breaker shall be provided with direct-acting series and/or solid state, bi-directional overcurrent trip device(s). This device shall provide the primary overcurrent protection for the circuit.	342116.16	2.03.H.4							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
456.	Traction Power Substation Equipment	Device No. 64, Enclosure Ground Relay: A high-resistance ground relay shall be connected between the DC switchgear enclosures, the rectifier metal enclosure and station ground.	342116.16	2.03.H.5							
457.	Traction Power Substation Equipment	Battery shall be designed and tested in accordance with applicable current standards of ANSI, NEMA, and IEEE. The contractor shall provide IEEE485 Battery Calcs, Design Margin = 1.20; Aging Factor = 1.25 verifying the Battery as well the Charger sizing.	342116.16	2.05.B							
458.	Traction Power Substation Equipment	Spill Containment System a. Shall be constructed of high density 4" high polyethylene pans in multiple sizes to allow battery rack to be contained within the containment. b. System shall include (qty.)	342116.16	2.05.C.5							
459.	Traction Power Substation Equipment	Ground pad with one (1) solderless compression terminal, for #14-#2 AWG.	342116.16	2.05.D.14.e							
460.	Traction Power Substation Equipment	Each transfer switch shall be equipped with an undervoltage relay Device 27. Upon loss of normal power, the undervoltage shall send out "Station Auxiliary Trouble" to K01, the annunciator and the SCADA SV1 via K02.	342116.16	2.08.2							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
461.	Traction Power Substation Equipment	The No. 4/0 AWG cables between the 15 KV circuit breaker and the transformer primary shall be copper, type MV-105, rated 15 KV, shielded, EPR 133% insulation, PVC flame retardant jacket, and suitable for indoors or outdoors, wet or dry locations, Okonite Catalog No. 115-23-3121 or approved equal.	342116.16	2.09.A							
462.	Traction Power Substation Equipment	The traction power cables shall comply with Section 34 22 00, Traction Power Cables.	342116.16	2.10.A							
463.	Traction Power Substation Equipment	The negative-ground disconnect switch handle shall have provision for one padlock to lock the switch in open position.	342116.16	2.12.D							
464.	Traction Power Substation Equipment	Provide a window to view the position of the disconnect switch. The window glass shall be clear safety glass with wire mesh.	342116.16	2.12.G							
465.	Traction Power Substation Equipment	Emergency trip pushbuttons shall be heavy-duty, oil-tight, NEMA Type 13, with two normally open and two normally closed contacts, General Electric Co. CR 2940-U203, or pre-approved equivalent, complete with box and stainless steel cover plate, and red mushroom head with guard. Nameplate shall be extra large, with red field and legend not less than ¼ inch high, EMERG. TRIP on one line.	342116.16	2.15.A							
466.	Traction Power Substation Equipment	The negative bus conductor shall be completely metal-enclosed, rated 10,000 amps, bare copper, insulated for 800VDC ungrounded system.	342116.16	2.14.C							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
467.	Traction Power Substation Equipment	Wiring in 615-Volt DC Compartments: All control and instrument wiring within 615-volt DC compartments shall be protected with flame-resistant barriers, and shall be routed as far as possible (but not less than ¼ inch) from 615-volt energized parts.	342116.16	3.02.D							
468.	Traction Power Substation Equipment	Test of Insulated Floors: The Contractor shall test the electrical resistance of the insulated (epoxy) floor before installing the equipment. Each test shall be made between the building ground and each of four (4) test points, using a small amount of water, approximately one square inch, to obtain contact with epoxy surface.	342116.16	3.05.C							
469.	Traction Power Substation Equipment	All equipment mounted within the substation shall be effectively grounded.	342116.16	3.06.E							
470.	Traction Power Testing and Training	Training Plan: Submit a Training Plan as specified in Article 3.06D herein.	342116.19	1.03.C							
471.	Traction Power Testing and Training	The Contractor shall submit a Testing and Start-Up Plan to the Engineer for approval 90 calendar days prior to actual testing. The work plan shall identify times, dates, locations, and durations of each test, and shall identify all participants necessary to perform and complete the testing. Detailed descriptions and procedures of each test shall be prepared in narrative form. No test shall be considered valid until the work plan has been approved by the Engineer.	342116.19	1.05.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
472.	Traction Power Testing and Training	Equipment components shall be tested for functionality prior to incorporating into its respective system. The Contractor shall submit Certificates of Compliance as proof that the components meet the requirements of this Contract. The Contractor shall certify all components' functionality prior to proceeding to the Commissioning Tests. The Contractor and the manufacturer representatives are required to perform the field tests to be witnessed by SFMTA authorized personnel, and the Contractor shall provide SFMTA 10 days notice prior to the field tests. Outstanding issues or punch list items developed in the field tests shall be resolved immediately prior to proceeding to the commissioning tests.	342116.19	3.02.A							
473.	Traction Power Testing and Training	After acceptance of the field tests, the Contractor shall proceed with the commissioning tests in conformance with the Schedule and Work Plan. The Contractor shall demonstrate to the City proper and complete operation of all installed systems. The Contractor shall not perform final system hookup and testing unless they are fully prepared to immediately address and correct system problems and malfunctions, especially when existing MTA systems and facilities are impacted.	342116.19	3.03.A							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
474.	Traction Power Testing and Training	The Contractor shall provide a program to educate, train, and teach personnel in all details of all equipment to the component level as required to enable SFMTA to operate, service, and maintain the equipment satisfactorily. The training program shall be implemented immediately prior to commissioning.	342116.19	3.04.B.1							
475.	Traction Power Poles	Contractor shall submit the following items for approval prior to ordering and fabrication: 5. Test data and results of pole deflection test.	342313	1.05.A							
476.	Traction Power Poles	Pole deflection testing shall be required for all pole types. Tests shall be conducted on not more than 5 percent of the poles in any lot of twenty or more and only one pole in any lot under twenty. A lot is defined as the number of poles of any one type covered by the Contract.	342313	2.04.A							
477.	Traction Power Poles	Each steel trolley pole shall be grounded.	342313	3.01.M							
478.	Overhead Cable Suspension	Training Programs and Materials: Prepare and submit Training Programs and Materials for City personnel.	342316	1.05.A.4							
479.	Overhead Cable Suspension	The Contractor shall submit Operation and Maintenance Manual, including preventive maintenance schedule for section insulators, new hardware to MUNI system, and other items as requested by the Engineer.	342316	1.05.A.6							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
480.	Overhead Cable Suspension	After installation of the OCS, megger all insulators. Replace insulators that are found defective.	342316	3.03.D.5							
481.	Overhead Testing and Acceptance	Contractor shall submit to the Engineer the following for review and approval: 1. Test Program Plan 2. Test Procedures 3. Test Reports	342316.16	1.03.A							
482.	Traffic Signals	Manufacturer's testing data shall be submitted to DPT Traffic Engineer at SF DPT, 1 South Van Ness Avenue, 7th Floor, SF CA 94103-5417, not Caltrans (overrides Caltrans LED specification sections 9.4.2.1 and 9.4.2.2).	343113	2.01.A.6.a							
483.	Traffic Signals	No vehicle signal heads will be considered pre-accepted by the City. Some signal heads manufactured by PEEK (TCT), Traffic Parts, Inc, and McCain Traffic Supply have demonstrated the ability to meet the City's specifications in the past. It is the Contractor's responsibility to demonstrate that each traffic signal head meets or exceeds the City's requirements as set forth in this Section. In order for a manufacturer other than those specified above to be considered for acceptance, a working sample must be submitted to the City's Traffic Signal Division for a minimum of 1 year for installation and field testing prior to being allowed for use on any of the traffic signals within the City.	343113	2.01.A.10							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
484.	Traffic Signals	Louvers shall be Directional Louvers in accordance with Caltrans Standard Plan ES-4C. Visors for signal faces shall be aluminum.	343113	2.02.A							
485.	Traffic Signals	Pedestrian signals shall conform to Section 86-4.06 "Pedestrian Signal Faces" of 2006 CTSS and shall be Type A, Hand/Walking Man, Symbol (http://www.dot.ca.gov/ hq/esc/oe/ specifications/std_specs/2006_StdSpecs/2006_StdSpecs.pdf). Pedestrian signal housing including the door shall be dye castaluminum.	343113	2.03.A							
486.	Traffic Signals	Testing and warranty information for countdown pedestrian signal LED modules shall be processed as follows: 1. Test units and manufacturer's testing data shall be submitted to DPT Traffic Engineer at SF DPT, 1 South Van Ness Avenue, 7th Floor, SF CA 94103-5417, not Caltrans (overrides Caltrans LED specification sections 4.4.2.1 and 4.4.2.2).	343113	2.03.D.1							

Item No.	Spec Section Title	Safety Requirement	Specification Reference		EVIDENCE						
			Sec	Para	Status	Method of Verification	Title of Verification Document	Approval Document File No.	File Verified By	File Verified Date	Verification Signature
487.	Traffic Signals	Performance Testing 1. The DPT Traffic Signal Shop will select one of the units from the first shipment for performance testing. 2. Evaluation of these tests is at the sole discretion of the DPT Traffic Signal Shop. 3. Tests include, but are not limited to: a. Interoperability: SF DPT shall install several different 2070 Lite controllers from multiple manufacturers to verify the cabinet works with 2070 Lite controllers. b. Operational testing: The unit shall be operated continuously for 24 to 72 hours continuously with a 2070 Lite controller emulating real world signal operation. Electric loads will be placed on the cabinet for this test to simulate actual use. c. Communication testing: The cabinet assembly's communication equipment will be tested. d. Fourth Dimension Traffic Software testing: The Traffic Signal Shop will test the traffic signal software on the 2070 Lite controller.	343113	2.11.E							
488.	Traffic Signals	Prior to delivery, the controller shall be tested by the controller manufacturer or authorized local distributor to ensure proper operation. The controller manufacturer shall provide certification that the controller has met all CALTRANS quality assurance tests.	343113	2.14.D							